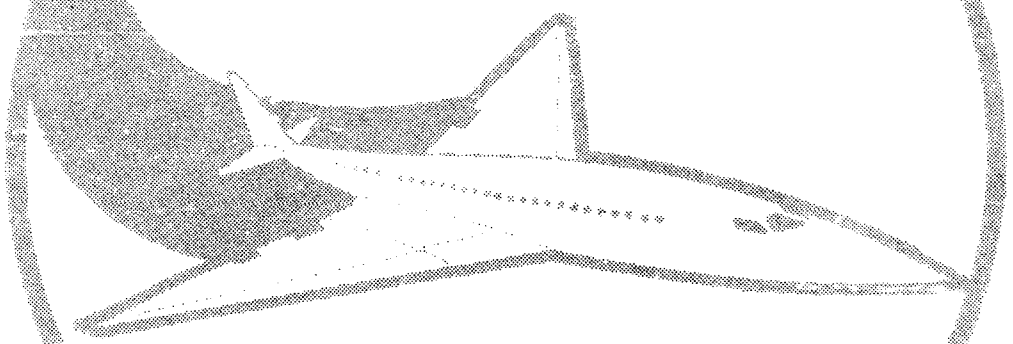
(2)

Terminal Doppler Weather Radar (TDWR) Operational Test and Evaluation (OT&E) Integration Test Plan

Eric Hess



November 1992

DOT/FAA/CT-TN92/6

U.S. Department of Transportation
Federal Aviation Administration

Technical Center
Atlantic City International Airport, N.J. 08405

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for the contents or use thereof.

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the objective of this report.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/CT-TN92/6		

4. Title and Subtitle	5. Report Date
Terminal Doppler Weather Radar (TDWR) Operational Test and Evaluation (OT&E) Integration Test Plan	November 1992
	6. Performing Organization Code: ACW-200
7. Author(s): Eric Hess, ACW-200, Peter Guthlein, EER Systems	8. Performing Organization Report No.: DOT/FAA/CT-TN92/6
9. Performing Organization Name and Address: Federal Aviation Administration, FAA Technical Center, Atlantic City International Airport, NJ 08405	10. Work Unit No. (TRAIS)
	11. Contract or Grant No.: DTFA01-89-C-00002
12. Sponsoring Agency Name and Address: U.S. Department of Transportation, Federal Aviation Administration, Surveillance Engineering Division, Washington, DC 20009	13. Type of Report and Period Covered
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The Terminal Doppler Weather Radar (TDWR) Operational Test and Evaluation (OT&E) Integration Test Plan provides the overall philosophy and approach to the TDWR OT&E Integration portion of Technical Field Test and Evaluation (TFT&E) to be conducted at the Federal Aviation Administration Aeronautical Center (FAAAC) in Oklahoma City, OK. This plan identifies the necessary support that is required to accomplish OT&E Integration; test roles and responsibilities of personnel, training requirements, and overall schedule of activities. This plan identifies the National Airspace System (NAS) operational and integration requirements of the TDWR. These requirements are contained in a Test Verification Requirements Traceability Matrix (TVRTM).

17. Key Words	18. Distribution Statement
TDWR OT&E Integration	Document is on file at the Technical Center Library, Atlantic City International Airport, NJ 08405

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	87	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS

1. INTRODUCTION.

The Federal Aviation Administration (FAA) has developed a Terminal Doppler Weather Radar (TDWR) to detect wind shear and other kinds of hazardous weather in the airport terminal area and to provide warnings to air traffic controllers and pilots.

A major goal of the TDWR program is to provide automatic detection and warning of microbursts, the most hazardous form of wind shear for aircraft approaching or departing from airports. In addition to microburst detection, information on gust fronts, wind shifts, and precipitation will be available. These products will be displayed in real time so that air traffic controllers can transmit alerts to pilots.

The FAA awarded a contract for production of 47 TDWR systems in the fall of 1988, to Raytheon Company, Sudbury, MA.

1.1 SCOPE.

This document provides the overall philosophy and approach to the TDWR Operational Test and Evaluation (OT&E) Integration portion of Technical Field Test and Evaluation (TFT&E) to be conducted at the FAA Aeronautical Center (FAAAC) in Oklahoma City, OK. This plan identifies the necessary support (e.g., personnel, documentation, etc.) that is required to accomplish OT&E Integration. Test roles and responsibilities of personnel, training requirements, and schedule of activities are also included. This plan identifies the National Airspace System (NAS) operational and integration requirements of the TDWR. These requirements are contained in the Test Verification Requirements Traceability Matrix (TVRTM) of appendix A.

1.2 PURPOSE.

The overall purpose of this plan is to ensure the successful OT&E Integration prior to fielding the TDWR in the NAS. To meet this objective, the TDWR must be operationally integrated with both new and/or existing systems (to be defined in section 5.). The installed TDWR must be tested in order to verify that it is functioning as specified in the NAS-SS-1000. It is this "end-state" configuration that this plan addresses, and it also discusses the methods of testing which must be conducted to ensure that the TDWR meets the NAS operational and integration requirements.

1.3 AUTHORITY TO CHANGE.

The authority to change the plan herein outlined is vested in the Test Director, FAA Technical Center, ACW-200.

2. REFERENCE DOCUMENTS.

This section lists the documentation and reference materials which relate to the contents of this plan.

2.1 FAA DOCUMENTS

2.1.1 FAA Specifications

FAA-E-2806a	Terminal Doppler Weather Radar Specification
FAA-E-2570b	Automatic Radar Tracking System (ARTS) Requirement
NAS-SS-1000	NAS System Specification Volumes I and III
NAS-SR-1000	NAS System Requirements Specification
NAS-IR-22013105	Interface Requirements for Tower Control Computer Complex (TCCC) to Terminal Doppler Weather Radar (TDWR) (TCCC/TDWR)
NAS-IC-31055103-00	Interface Control Document for TDWR (RMS)/ Maintenance Processor Subsystem (MPS)
NAS-IC-31055104-00	Interface Control Document for TDWR/ Maintenance Data Terminal (MDT)
NAS-IC-31052201-00	Interface Control Document for TDWR/Tower Control Computer Complex (TCCC)

2.1.2 FAA Standards

FAA-STD-024a	Preparation of Test and Evaluation Documentation

2.1.3 FAA Orders

No. 1810.4B	FAA NAS Test and Evaluation Policy
No. 1812.9	System Requirements Statement for the Terminal Doppler Weather Radar
No. 6560.26	Project Implementation Plan (PIP) for the TDWR
No. 1810.2A	Independent OT&E

2.1.4 Other FAA Documents

Transportable Radar Analysis Computer System (TRACS) User's Manual

2.2 MILITARY AND FEDERAL PUBLICATIONS

2.2.1 Military Standards

MIL-STD-1472C	Human Factors Standard

2.2.2 Federal Documents

DOD-STD-2167	Defense System Software Development

2.3 OTHER DOCUMENTS

TDWR MTP	Terminal Doppler Weather Radar Master Test Plan
NAS-MD-110	Test and Evaluation (T&E) Terms and Definitions for the NAS
NAS-MD-790	Remote Maintenance Monitoring System (RMMS) Interface Control Document
NAS-MD-792	Operational Requirements for the Remote Maintenance Monitoring System (RMMS)
NAS-MD-793	RMMS Functional Requirements for the Remote Monitoring Subsystem (RMS)
ASM-630	TDWR Shakedown Test Plan
CDRL # D001-2	TDWR Contractor's Master Test Plan (CMTP)
CDRL # D002-3	Design Test and Evaluation (DT&E) Test Plan
CDRL # D004-3	Installation Checkout and Acceptance (IC&A) Test Plan
CDRL # D007-3	Turnkey Installation Test Plan

3. TDWR OT&E INTEGRATION TEST PLAN OVERVIEW.

This section contains background information required to substantiate that the system requirements delineated in FAA Order 1812.9 are being met and also to facilitate an understanding of the testing activities performed at the test site.

3.1 TDWR OT&E INTEGRATION TEST PLAN PHILOSOPHY.

The TDWR OT&E Integration Test Plan will provide assurance in the verification of the applicable requirements identified in the TVRTM, as discussed in section 4 of this plan. FAA Order 1810.4B directs the verification of all system/subsystem requirements, and states that these requirements will be verified as early as possible in the procurement process. The FAA Program Engineering Service (ANR) has responsibility for developing and implementing the verification process for requirements of each project. The FAA Technical Center will support ANR throughout the verification process. The TDWR Program Office, ANR-500, may delegate verification activities to other FAA organizations, independent contractors, and/or the prime project contractor, Raytheon Company.

With this philosophy implemented, ACW-200 will ensure that the following OT&E Integration related activities are accomplished:

a. Develop an OT&E Integration Test Plan, including a TVRTM, which contains a reference to each of the NAS operational and integration requirements.

b. Develop detailed OT&E Integration Test Procedures and appropriate simulation scenario scripts necessary for each of the tests defined in the TDWR OT&E Integration Test Plan.

c. Assist ANR-500 in Installation, Checkout, and Acceptance (IC&A) testing and Design Qualification Testing (DQT) by reviewing test procedures and providing an FAA witness for these tests.

d. Conduct NAS OT&E Integration of the TDWR using first production deliveries to the test site (Oklahoma City) and identify those areas which were/could not be verified.

e. Verify and document the completion of each test with a success criteria that satisfies the TVRTM.

f. Distribute questionnaires to pilots and air traffic controllers. The questionnaires will be used to assess the observations of participating personnel regarding the functional and physical characteristics of the data displays and the acceptability and timeliness of the weather warnings. An example of the questionnaires to be used for OT&E Integration are included in appendix B. These questionnaires are merely examples and are not the questionnaires that will be used for OT&E Integration.

g. Track and status problems encountered during OT&E Integration using service reports as defined in section 7.2.3.

h. Provide test reports/notification to the ANR-500 on the pass/failure of the TDWR subsystem in the area of OT&E Integration.

When OT&E Integration is complete, the following objectives will be satisfied:

a. Ensure early detection of interface design problems.

b. Verify that the interface design yields specification mandated performance.

c. Verify the TDWR's capability to properly interface with available (simulated) equipment and/or subsystems at the test site.

d. Minimize risks associated with proceeding toward the next project milestone.

e. Provide guidance to follow-on TDWR sites in the area of OT&E Integration.

f. Ensure that an operationally effective and suitable system is implemented into the NAS.

The verification of all system-level requirements will determine the TDWR operational effectiveness and suitability, and identify operational deficiencies to provide information on operational procedures, organizations, training, logistics, and personnel requirements prior to field deployment. It is these system-level requirements which this plan is structured to satisfy.

3.2 TDWR OT&E INTEGRATION TEST PLAN - APPROACH AND CONCEPT.

In order to determine the overall operability of the TDWR with the NAS environment, OT&E Integration requires that the TDWR be installed in an operational environment with operational support available, i.e., Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control Facility (TRACON). An operational environment relates to the configuration into which the TDWR must be integrated. For this reason, both live and/or simulated interfacing subsystems and equipment will be used. Air Traffic (AT) and Airways Facilities (AF) field site personnel will also be requested to participate in test efforts. These test efforts will include providing support in writing and executing the detailed test procedures that will be generated by ACW-200 to verify the requirements identified for testing. The TDWR OT&E Integration will be performed using all interfaces available and appropriate to the TDWR system.

To fully understand the approach and concepts of testing, the differences between the terms "interim" and "end-state," and how these terms relate to testing, must first be understood. The TDWR is one project of the NAS Plan. The NAS Plan's goal is the modernization and improvement of the government systems supporting aviation commerce in the United States. The time after the plan has been fully implemented is called the "end-state" of the NAS. The period before all equipment of the NAS has been fielded is the "interim" period. In the interim period, the TDWR product information will be displayed to air traffic controllers and controllers' supervisors on equipment supplied by the TDWR contractor, Raytheon Company. In the end-state of the NAS Plan, the TDWR will send weather product information to Air Traffic Control (ATC) computers and the Tower Control Computer Complex (TCCC).

In order to save schedules and avoid unnecessary duplication of activities, Raytheon will participate in efforts aimed at carefully coordinating the contractor and government testing. Descriptions of Raytheon test planning (at Raytheon, as well as on-site at the test site) may be found in the Contractor's Master Test Plan (CDRL-D001-2), sections 3.3.3 and 4.3, and DT&E Test Plan (CDRL-D002-3), section 3.3.

3.2.1 TDWR OT&E Integration Testing Baseline.

Since the TDWR is an end-state system, the TDWR OT&E Integration testing configuration is baselined in accordance with NAS-SS-1000. The OT&E Integration verification on an end-state subsystem must be conducted in a well documented, "step-by-step" process. One "step" at a time means combining end-state with interim configurations, wherever possible, and documenting verified end-state requirements, until ultimately achieving the end-state integrated configuration. Each "step" completion will be evident by the documented verification that the TDWR functionally and physically interfaced with an end-state subsystem.

The TDWR OT&E Integration test will ultimately consist of one unique end-state configuration. This configuration is composed of the TDWR subsystem interconnected with other subsystems as shown in figure 3.2.1-1. The Low Level Wind Shear Alert System (LLWAS) interface is shown. However, this interface is reserved. Each interconnection (interface) within the configuration is defined as a verification category (CAT). For ease of identification and traceability to the TVRTM, a letter has been assigned to each verification category. This lettering system becomes clear in section 5.

The approach to TDWR OT&E Integration testing at the test site will first require each identified interface (verification category) to be verified individually, followed by a combination of the verification categories to form the End-State System Level Test. For interfaces which are not available for testing, interim subsystems and/or simulation tools will be used to verify the associated requirements. Inputs used will consist of live and/or simulated information including message data, as defined in the subsections of section 5. This will add further assurance that each test will assist in the verification of the assigned OT&E Integration requirements.

3.2.2 Verification Methods.

Two types of verification methods will be applied to the verification categories conducted. The methods of verification are defined as follows:

a. Test (T) - Test is a method of verifying performance requirements of subsystem/system or configuration items by quantitative measurements of controlled functional or environmental stimuli. These dynamic measurements are made using standardized laboratory equipment, procedures, or other services, then analyzed to determine their compliance.

b. Demonstration (D) - Demonstration is a method of verifying subsystem/system or configuration item requirements by observing their functional response to dynamic exercising. This qualitative evaluation is made using criteria from technical procedures, excluding measurements. Acceptance is based on pass/fail results.

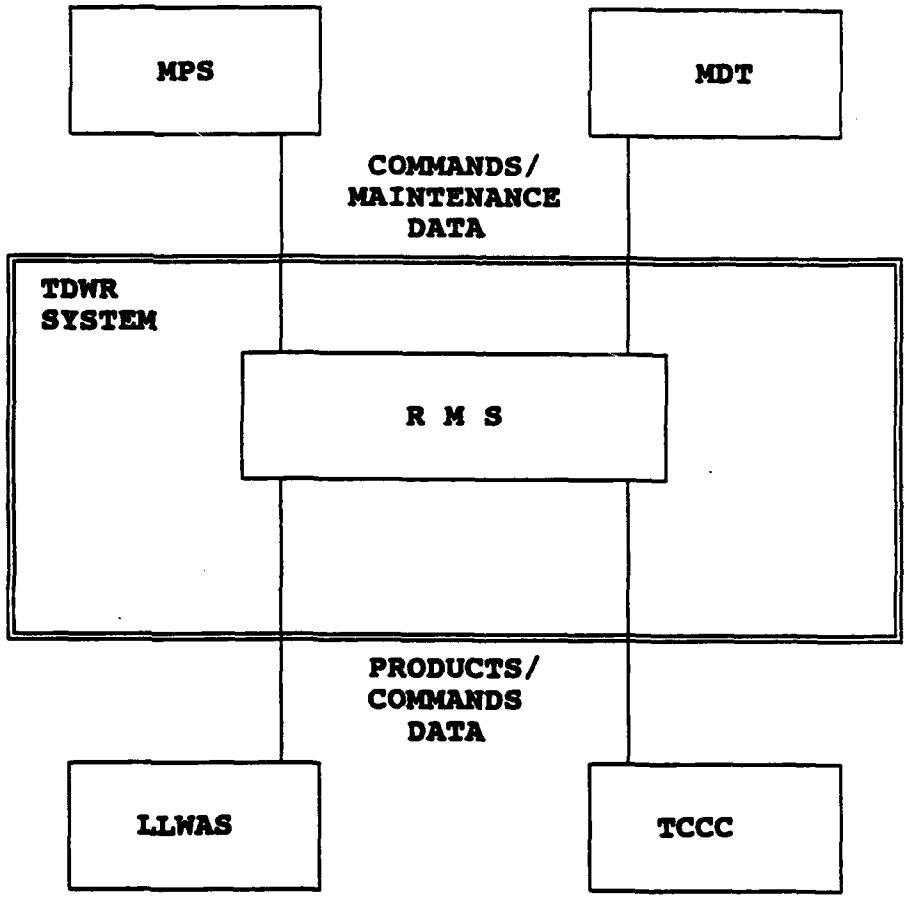


FIGURE 3.2.1-1. TDWR SYSTEM DIAGRAM

3.3 TDWR OT&E INTEGRATION ACTIVITY FLOW.

The sequence of TDWR OT&E Integration tests and the associated pretest activities to be conducted at the test site are presented in figure 3.3-1.

Raytheon will interface the TDWR radar to the appropriate radar processing and display subsystems located at the first test site, Oklahoma City, OK. Raytheon shall then proceed with Installation Checkout and Acceptance (IC&A) and on-site DQT to validate that the installed system satisfies the requirements of FAA-E-2806a. The DQT ends with a 72-hour continuous operation of the system without hardware or software failure. The Reliability Demonstration follows and this will be conducted 24 hours per day, 7 days per week until the satisfactory number of operating hours have accumulated. Raytheon is responsible for conducting this Reliability Demonstration. A Preliminary Contractor Acceptance Inspection (PCAI), a dry run of the formal Contractor Acceptance Inspection (CAI), will follow. At this time, the integrated system and all documentation will be handed over to ANR-500 in preparation for Technical Field Test and Evaluation (TFT&E).

4. TDWR OT&E INTEGRATION VERIFICATION CONTROL.

The following section describes the method that will be utilized to ensure traceability of requirements to the verification categories and test configuration discussed in section 3 and defined in section 5 of this plan.

4.1 TDWR TVRTM.

The TVRTM contained in appendix A identifies the TDWR end-state requirements that will be verified throughout TDWR OT&E Integration. This matrix was developed in accordance with appendix IV of FAA-STD-024a, NAS-SS-1000, and NAS-SR-1000.

The TVRTM lists the applicable requirements from NAS-SS-1000, Volumes I and III, that require integration verification. Each of the requirements will be verified by the identified verification methods (denoted by a "D" for demonstration, or a "T" for test) through the successful completion and execution of TDWR NAS OT&E Integration Test Procedures. Test procedures will be developed for each verification category discussed in section 3.2 and as defined in section 5 of this plan. The actual tests to be conducted will be identified in the test procedures. In most instances, several of the NAS requirements listed in the TVRTM will be satisfied by one single test procedure. Therefore, the exact number of test procedures cannot be determined until they are written.

This plan, along with the TVRTM and resultant test reports of TDWR OT&E Integration, will be made available to the Program Office for use at future TDWR sites to help insure the timely completion of TDWR OT&E Integration.

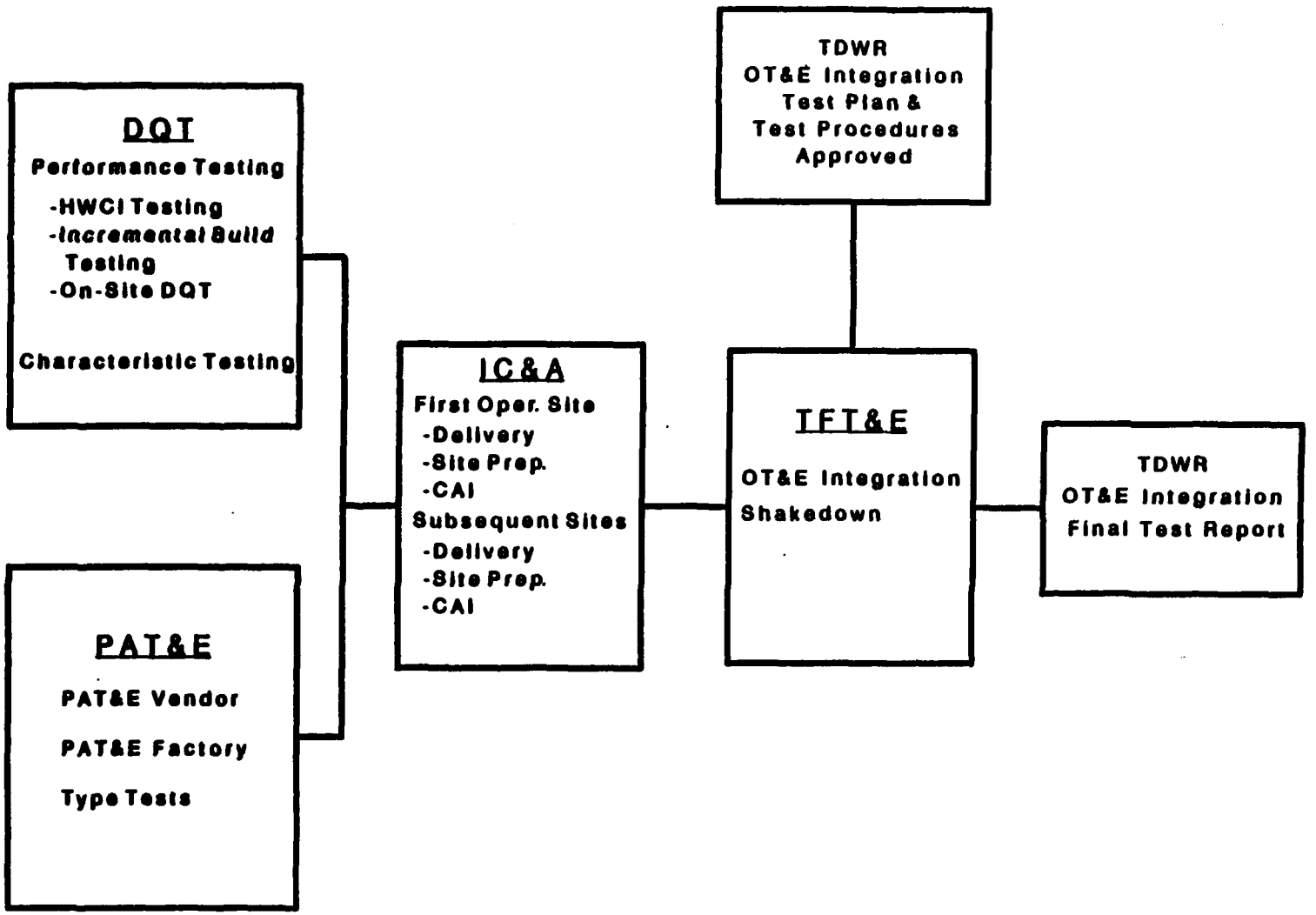


FIGURE 3.3-1. TDWR OT&E INTEGRATION ACTIVITY FLOW DIAGRAM

5. TDWR OT&E INTEGRATION TEST CONFIGURATION.

The TDWR OT&E Integration consists of the configuration and related verification categories discussed in section 3.2 of this plan. This section will define the test configuration and its associated verification categories.

The requirements of the TVRTM discussed in section 4 have been logically grouped. These groups are verification categories. Each category has been developed to identify a specific TDWR subsystem's interface capability to function properly in the NAS system. The term interface is interchangeable with the term verification category much in the same manner as the terms integration and interface testing are interchangeable as defined by NAS-SS-1000. The tests will be performed in a logical manner. Tests that rely on completion of other tests are considered subordinate tests and will be performed upon satisfactory completion of primary tests. A description of the primary and subordinate tests will be included in the test procedures. Upon successful testing of all interfaces, tests for an end-state system will be performed.

For each verification category, the following information will be specified: test description, test objectives, evaluation criteria, test configurations, support hardware, support software, special test equipment, data analysis, and documentation that will be required for its verification. This information shall be utilized for the development of the detailed TDWR OT&E Integration Test Procedures. A description of the test configuration, followed by each of the verification categories (which comprise the configuration), is presented in the following subsections. The verification categories, or interfaces, for the configuration are as follows:

CONFIGURATION 1 - Terminal

Category A	TDWR/TCCC Interface
Category B	TDWR Remote Monitoring System (RMS)/Maintenance Data Terminal (MDT)/Maintenance Processor Subsystem (MPS) Interface
Category C	End-State System Level Test

5.1 TEST ACCOMPLISHMENT.

This section presents the tests which will be performed for requirements verification. The OT&E Integration, as contained in the TVRTM, is a repeat of that previously accomplished by Raytheon with the same TDWR system located at the factory site. The purpose of this testing is to reverify the system interface in a different clutter environment. These tests may not be as extensive as the previous tests. The same test sequence will be followed but will not be repeated in detail in this section, except as necessary, to satisfy interface differences and concerns related to the test site.

5.1.1 Category A - TDWR/TCCC.

Verification Category A will verify the requirements related to the transmission of products, equipment status, TDWR modes, and receipt of commands from the TDWR subsystem to the TCCC located in the ATCT. It will verify the data exchange required from the TDWR in accordance with ICD NAS-IC-31052201-00, NAS-SS-1000, and FAA-E-2806a. These tests will be conducted using approved test procedures.

Note: The TCCC interface will not be available for OT&E Integration testing (June - September 1992). Test Operators will use appropriate simulation hardware to satisfy test objectives.

5.1.1.1 Test Objectives.

The objectives of Category A testing is to verify that the TDWR has the capability to interface with the TCCC in accordance with the following TVRTM requirements:

1170, 1171, 1290

5.1.1.2 Evaluation Criteria.

The criteria for success shall be the assurance that each requirement listed for Category A in the TVRTM, and the objective stated in section 5.1.1.1, has been satisfied. This criteria for success for each requirement shall be that the weather data, products, and alert messages disseminated to the TCCC from the TDWR is correct.

5.1.1.3 Test Configuration.

Verification Category A test configuration is as shown in figure 5.1.1.3-1.

5.1.1.4 Support Hardware.

The following support hardware will be required for Category A testing:

a. TCCC (or simulated TCCC)
b. Geographic Situation Display (GSD)
c. Ribbon Display Terminal (RDT)

5.1.1.5 Support Software.

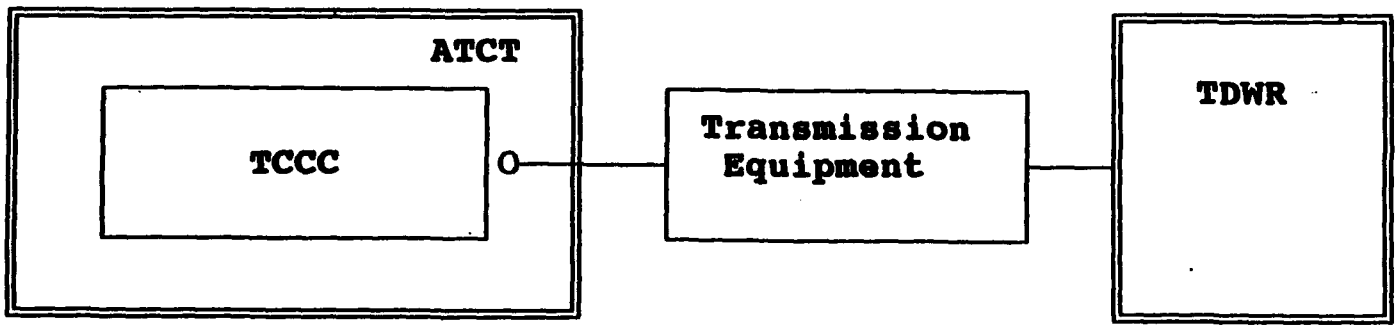
The following support software will be required for Category A testing:

TBD

5.1.1.6 Special Test Equipment.

The following special test equipment will be required for Category A testing:

a. Archive Data Recorder
b. Time Series Recorder
c. Base Data Recorder
d. Government-Furnished Equipment (GFE) Modems
e. Hard Copy to GSD and RDT



O Point of Interface

FIGURE 5.1.1.3-1. CATEGORY A - TDWR/TCCC INTERFACE

5.1.1.7 Data Analysis.

Test data will be gathered by designated test team members from test logs, printer outputs, and storage devices (disk drives, tape drives, etc). The data will be analyzed in detail to provide a comprehensive analysis of the TDWR. Data will be analyzed during test conduct to insure that the tests are proceeding as predicted. In addition, all data will be thoroughly analyzed after the fact to insure that all discrepancies are noted and properly addressed.

5.1.1.8 Documentation.

The following reference material will be made available to appropriate personnel prior to test conduct.

TDWR Master Test Plan
TDWR OT&E Integration Test Plan
TDWR OT&E Integration Test Procedures
NAS-IC-31052201-00 - TDWR/TCCC ICD
NAS-SS-1000 - NAS System Specification
FAA-E-2806a - TDWR Specification

5.1.2 Category B - TDWR (RMS)/RMMS.

Verification Category B will verify that the required interfaces between the TDWR and Remote Maintenance Monitoring System (RMMS) are properly integrated. This verification category includes the following:

a. TDWR (RMS)/MPS
b. TDWR (RMS)/MDT

The RMMS will provide the capability to monitor the performance of and remotely adjust equipment and facilities through the use of RMSs embedded in the TDWR. All RMSs shall communicate with a centrally located data processor, the MPS. The MPS shall control the communications flow to all remote facilities and shall collect, record, and analyze the facility data. MDTs will be used to enter commands, data requests and messages, and to display the responses to those commands, data requests, and messages.

5.1.2.1 Test Objectives.

a. Verify that the TDWR provides the NAS adequate data to continually monitor subsystem performance to obtain data needed by specialists for maintenance and operations support in accordance with the following TVRTM requirement:

2110

b. Verify that the TDWR provides the status of subsystems to specialists and generates alarms upon deviation of designated parameters from prescribed limits in accordance with the following TVRTM requirement:

2120, 2670

c. Verify that the TDWR provides the NAS sufficient data for a specialist on site or at an off-site location to control selected subsystems for maintenance purposes in accordance with the following TVRTM requirement:

2130, 2650, 2660

d. Verify that the TDWR provides the NAS sufficient data to allow the specialist the capability to identify the line replaceable unit (LRU) causing an equipment failure in accordance with the following TVRTM requirement:

2140

e. Verify that the TDWR provides the NAS sufficient data to allow the specialist access to monitoring, control, and data management capabilities of the NAS as required and as authorized by administrative directive in accordance with the following TVRTM requirement:

2150

f. Verify that the TDWR provides the NAS adequate data to allow continuous monitoring of status, including configuration and mode, alarms set and reset, and performance of selected subsystems. The TDWR will also automatically provide the accumulated status and performance data. It will also provide reports that contain only state changes and alarms/alerts in response to a subsystem status report or RMMS access request by a specialist through an MDT, in accordance with the following TVRTM requirements:

2210, 2310, 2320, 2330, 2331, 2340, 2341,
2350, 2360, 2390, 2550, 2610, 2620

g. Verify that the TDWR provides for the NAS an alarm when smoke, fire, or physical intrusion occurs in a subsystem facility. An alarm will also be provided when the electrical power or Heating, Ventilation, and Air Conditioning (HVAC) monitored parameters are out of tolerance at unmanned facilities. Control of HVAC and electrical power in unmanned facilities will also be verified. When the above conditions are cleared, alarms will be reset in accordance with the following TVRTM requirements:

2370, 2371, 2372, 2380, 2381, 2470, 2480,
2520, 2540

h. Verify that the TDWR provides the NAS an alert when selected subsystem parameters are outside a predetermined range with the capability to change the range or allow the specialist to disable them on site. The disabling function will be reported as performance data in accordance with the following TVRTM requirements:

2410, 2420, 2421, 2430, 2440, 2510

i. Verify that the TDWR provides the NAS subsystem certification data in response to a certification exercise and subsystem diagnostic data in response to a diagnostic test request in accordance with the following TVRTM requirements:

2450, 2460, 2520, 2530

j. Verify that the TDWR provides NAS the capability for the controller to change the current operating mode of any subsystem to any other proper operating mode of a subsystem. The capability for local input and display of data and commands to a subsystem via the MDT shall be verified. The specialist can obtain exclusive control on site upon request. The above will be verified in accordance with the following TVRTM requirements:

2490, 2520, 2560, 2570, 2630, 2640, 2670

k. Verify that the TDWR shall provide the capability to measure system performance factors in accordance with the following TVRTM requirements:

2220, 2230, 2240, 2250

5.1.2.2 Evaluation Criteria.

The criteria for success shall be the assurance that each requirement listed for Category B in the TVRTM has been satisfied and is in accordance with NAS-SS-1000, NAS-MD-790, NAS-MD-792, NAS-MD-793, and the TDWR ICD. The pass/fail determination for each requirement will be verified by test or demonstration.

This criteria for success shall be applied individually against each objective stated in section 5.1.2.1 to determine if the TVRTM requirements have been met as defined below;

a. Each TDWR communication between the RMS and the MPS is correct,

b. Each RMS status report of the TDWR is correct,

c. Each RMS response to TDWR generated equipment alarm, state change, and threshold change condition is correct,

d. Each TDWR response to diagnostic and certification commands sent by the MPS is correct,

e. Each TDWR communication between the MDT and the MPS is correct,

f. Each monitoring of the TDWR by the MDT for status is correct,

g. Each MDT response to TDWR-generated equipment alarm, state change, and threshold change condition is correct,

h. Each MDT command given to the TDWR is correct,

i. Each TDWR response to diagnostic and certification commands sent by the MDT is correct.

5.1.2.3 Test Configuration.

Verification Category C test configuration is as shown in figure 5.1.2.3-1.

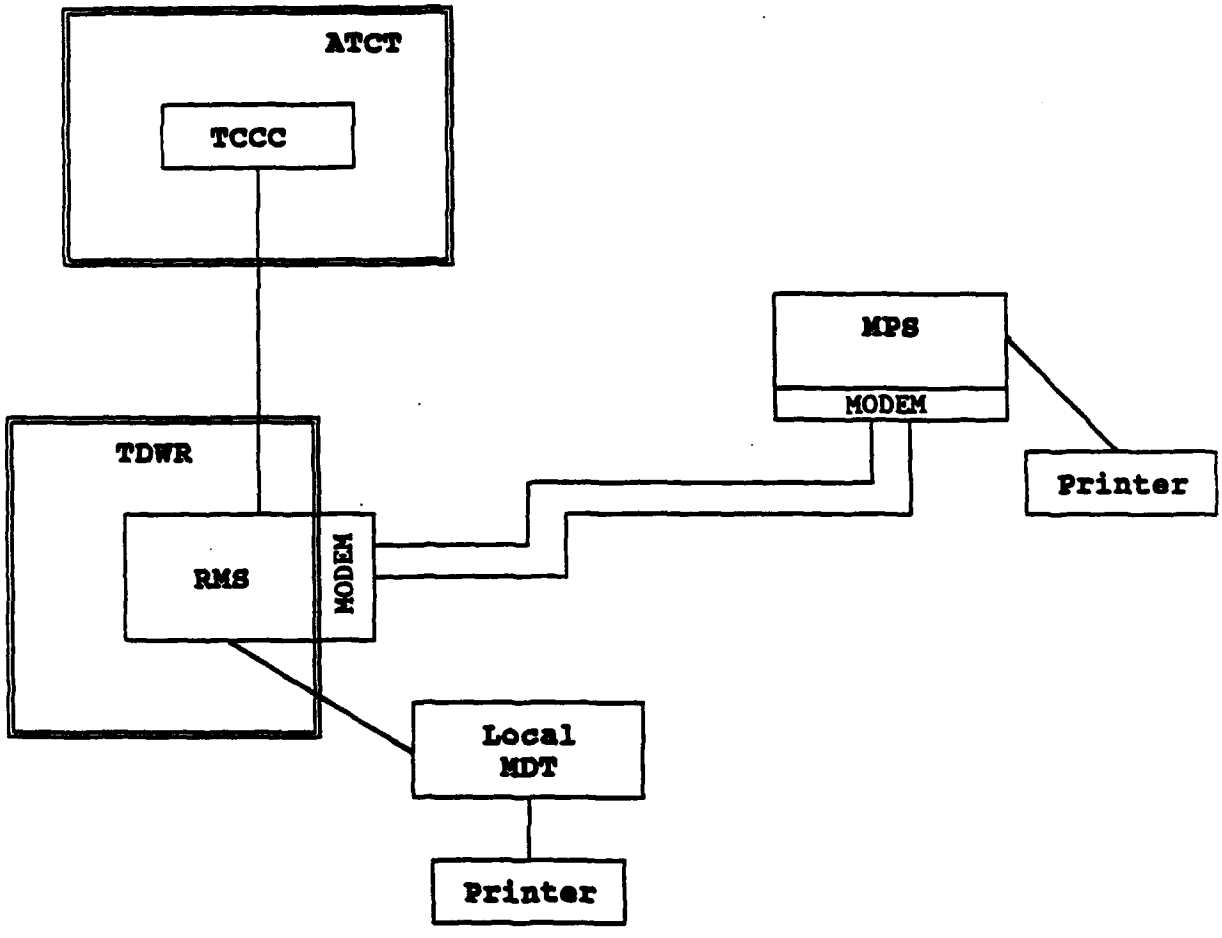


FIGURE 5.1.2.3-1. CATEGORY B - TDWR/RMMS INTERFACE

5.1.2.4 Support Hardware.

The following support hardware will be required for Category B testing:

a. MPS
b. MDT

5.1.2.5 Support Software.

The following support software will be required for Category B testing:

TBD

5.1.2.6 Special Test Equipment.

The following special test equipment will be required for Category B testing:

a. Base Data Recorder
b. Time Series Recorder
c. GFE Modems

5.1.2.7 Data Analysis.

Test data will be gathered by designated test team members from test logs, printer outputs, and storage devices (disk drives, tape drives, etc). The data will be analyzed in detail to provide a comprehensive analysis of the TDWR.

Actual inputs shall be analyzed against actual outputs to determine if appropriate responses were generated in accordance with the TVRTM requirements. These requirements include information which specifies response times. Data throughput response times will be analyzed. Also, outputs will be compared against related documentation to verify the output data is correct. Any discrepancies will be noted and documented.

Data is to be recorded during each section of the test. The data will be stored in data files and the names of the data files will be clearly marked in the test procedures. These files will be recorded in computers for later transfer to 360 kilobytes (Kb) floppy disks.

Data will be analyzed during test conduct to insure that the tests are proceeding as predicted. In addition, all data will be thoroughly analyzed after the fact to insure that all discrepancies are noted and properly addressed. A major part of the data analysis will involve comparing data on more than one device to verify accuracy of data transfer and timeliness of command/response. All data files will be retained in the test package. The data recorded for the run record will be retained in both hard copy and soft copy. The data will be clearly annotated as to collection details and the hard copy will be appended to the final test report.

Data is to be recorded during each section of the test into files. These files will be recorded on the computers and simulators to be stored on 360 Kb floppies.

5.1.2.8 Documentation.

The following reference material will be made available to appropriate personnel prior to test conduct.

TDWR Master Test Plan
TDWR OT&E Integration Test Plan
TDWR OT&E Integration Test Procedures
NAS-IC-31055103-00 - TDWR (RMS)/MPS Interface Control Document (ICD)
NAS-IC-31055104-00 - TDWR/MDT ICD
NAS-MD-790 - RMMS ICD
NAS-MD-792 - Operational Requirements for the RMMS
NAS-MD-793 - RMMS Functional Requirements for the RMS
NAS-SS-1000 - NAS System Specification
FAA-E-2806a - TDWR Specification

5.1.3 CATEGORY C - END-STATE SYSTEM LEVEL TEST.

Verification Category C will be performed to demonstrate compliance with functional, performance, and physical requirements. This test will demonstrate TDWR operational effectiveness and the functionality of the displays. It will provide evaluation of response times and output formats.

5.1.3.1 Test Objectives.

a. Verify that the TDWR has the capability to collect and/or sense weather information, to identify and classify weather phenomena, to analyze and process return signals, to generate weather products and weather maps, and to provide displays in accordance with the following TVRTM requirements:

3010, 3020, 3030, 3040, 3090, 3110, 3120,
3121, 3122, 3123, 3130, 3131, 3132, 3140,
3141, 3142, 3143, 3150, 3151, 3152, 3153,
3154, 3155, 3156, 3310

b. Verify that the TDWR has the capability to disseminate weather products and alert messages to interfaces and subsystems in accordance with the following TVRTM requirements:

3170, 3171, 3180, 3181, 3290, 3291

c. Verify that the TDWR has the capability to detect weather within specified parameters, resolutions, and accuracies in accordance with the following TVRTM requirements:

3190, 3191, 3192, 3210, 3211, 3212, 3220,
3221, 3222, 3230

d. Verify that the TDWR has the capability to archive derived products and weather information in accordance with the following TVRTM requirements:

3050, 3260

e. Verify that the TDWR has the capability to operate within a specified frequency in accordance with the following TVRTM requirement:

3240

f. Verify that the TDWR has the capability to generate alert messages when prespecified threshold conditions occur in accordance with the following TVRTM requirements:

3160, 3270

g. Verify that the TDWR has the capability to detect weather information and provide weather data within specified times in accordance with the following TVRTM requirements:

3060, 3070, 3080, 3250, 3270, 3280

5.1.3.2 Evaluation Criteria.

The evaluation for success shall be the assurance that each requirement listed for Category C in the TVRTM has been satisfied and is in accordance with NAS-SS-1000. The pass/fail determination for each requirement will be verified by test or demonstration.

This criteria for success shall be applied individually against each objective stated in section 5.1.3.1 to determine if the TVRTM requirements have been met, as defined below;

a. Each TDWR display (both GSD and RDT) reflects the correct weather phenomena and alert message,

b. Each TDWR archived data slice is correct,

c. The TDWR operating frequency is correct,

d. Each specified parameter, resolution, and accuracy of the TDWR is correct.

5.1.3.3 Test Configuration.

Verification Category C test configuration is as shown in figure 5.1.3.3-1.

5.1.3.4 Support Hardware.

The following support hardware will be required for Category C testing:

a. TCCC (or simulation)
b. GSD
c. RDT

5.1.3.5 Support Software.

The following support software will be required for Category C testing:

TBD

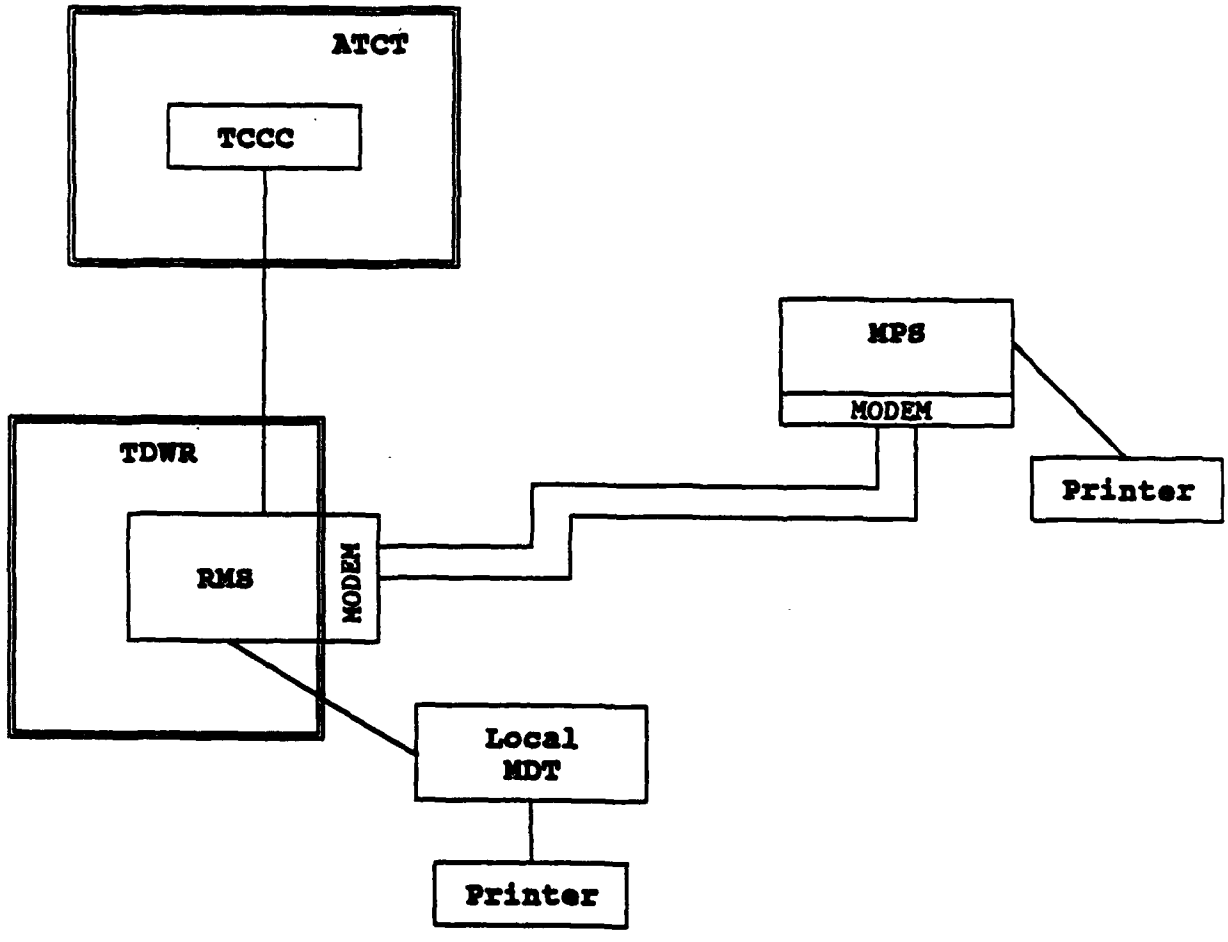


FIGURE 5.1.3.3-1. CATEGORY C - END-STATE SYSTEM LEVEL TEST

5.1.3.6 Special Test Equipment.

The following special test equipment will be required for Category C testing:

a. Archive Data Recorder
b. Base Data Recorder
c. Time Series Recorder
d. GFE Modems
e. Hard Copy to GSD and RDT

5.1.3.7 Data Analysis.

Test data will be gathered by designated test team members from test logs, printer outputs, and storage devices (disk drives, tape drives, etc.). The data will be analyzed in detail to provide a comprehensive analysis of the TDWR.

Actual inputs shall be analyzed against actual outputs to determine if appropriate responses were generated in accordance with the TVRTM requirements. These requirements include information which specifies response times. Data throughput response times will be analyzed. Also, outputs will be compared against related documentation to verify the output data is correct. Any discrepancies will be noted and documented.

Data is to be recorded during each section of the test. The data will be stored in data files and the names of the data files will be clearly marked in the test procedures. These files will be recorded in computers for later transfer to 360-Kb floppy disks.

Data will be analyzed during test conduct to insure that the tests are proceeding as predicted. In addition, all data will be thoroughly analyzed after the fact to insure that all discrepancies are noted and properly addressed. A major part of the data analysis will involve comparing data on more than one device to verify accuracy of TDWR displays and timeliness of command/response. The data recorded for the run record will be retained in both hard copy and soft copy. The data will be clearly annotated as to collection details and the hard copy will be appended to the final test report.

Data is to be recorded during each section of the test into files. These files will be recorded on the computers and simulators to be stored on 360-Kb floppies.

5.1.3.8 Documentation.

The following reference material will be made available to appropriate personnel prior to test conduct:

TDWR Master Test Plan
TDWR OT&E Integration Test Plan
TDWR OT&E Integration Test Procedures
NAS-SS-1000 - NAS System Specification
FAA-E-2806a - TDWR Specification

6. TDWR INTEGRATION TESTING ORGANIZATIONAL ROLES AND RESPONSIBILITIES.

The FAA Technical Center is the organization responsible for conducting OT&E Integration. The FAA Technical Center (ACW-200) has the overall responsibility for the conduct and coordination of the evaluation. The specific responsibilities of the FAA Technical Center are listed below.

6.1 TDWR TEST MANAGEMENT GROUP.

The function of the TDWR Test Management Group is to direct all test efforts relative to OT&E Integration. This group will be comprised of representatives from the FAA and their support contractors. Specific responsibilities of the Test Management Group are as follows:

a. Establish policies related to TDWR OT&E Integration activities.

b. Concur with all test plans and procedures related to TDWR OT&E Integration activities.

c. Distribute TDWR OT&E Integration related documentation to all participating organizations for review.

d. Assign roles and responsibilities to the TDWR Test Support Group.

The TDWR Test Management Group will coordinate and assign particular tasks to each organization represented in the TDWR Test Support Group. Each organization will be responsible for accomplishing assigned tasks and personnel assignments.

6.2 TDWR TEST SUPPORT GROUP.

The TDWR Test Support Group will consist of a group of specialists who are knowledgeable in specific technical areas. The role of this group will be to support the TDWR Test Management Group in developing test requirements, plans, procedures, scenarios, and other test support tools. This group will also conduct tests, perform test analysis, and produce test reports.

Personnel from this group will provide the services necessary to establish, schedule, maintain, and control the activities of the TDWR OT&E Integration effort. A detailed schedule will be provided prior to the start of the test period.

The TDWR Test Support Group will be comprised of personnel from organizations shown in table 6.2-1. Responsibilities of the members are also noted. A summation of the responsibilities associated with the support group include, but are not limited to, the following:

a. Conduct or participate in TDWR OT&E Integration;
b. Maintain, analyze, and report test results;
c. Perform assigned test roles as directed by the TDWR Test Management Group.

TABLE 6.2-1. TDWR TEST SUPPORT GROUP RESPONSIBILITIES

GOVT/FAA	PRIMARY ROLES/FUNCTIONS
ACW-200	Test Program Manager (ACW-200) shall provide overall coordination and direction of the TDWR OT&E Integration. ACW-200 will serve as a single point of control for each aspect of the testing defined in this plan. ACW-200 will maintain test logs and issue final test reports. ACW-200 will prepare the OT&E Integration Test Plan and Test Procedures, conduct OT&E Integration, participate in TDWR status and review meetings as directed, and publish an OT&E Integration Final Report.
ASM-630	Provide assistance and support to the implementation of this plan by reviewing the OT&E Integration Test Plan, Test Procedures, test data and test reports, and by providing personnel to serve as members of the TDWR OT&E Integration test team for test operations and test analysis. ASM-630 will perform Shakedown Testing.
ATR-120/ AF, AT Field Site Personnel Integration	Provide assistance and support to the implementation of this test plan by reviewing the OT&E Integration Test Plan, Test Procedures, test data and test reports, and by providing personnel to serve as members of the TDWR OT&E Integration test team for test operations and test analysis. Serve as members of the TDWR OT&E Integration test team for test monitoring, test observation, and test analysis. This will allow for initial training and a preliminary assessment of the effectiveness and suitability of the TDWR in an operational environment.
ATQ-1	Review the OT&E Integration Test Plan, Test Procedures, test data, and test reports. They shall also observe tests, attend all briefings, status meetings, and review meetings.

SUPPORT CONTRACTOR	PRIMARY ROLES/FUNCTIONS
Systems Engineering and Integration Contractor (SEIC) - Technical	Support ACW-200 in TDWR OT&E Integration activities, as directed by ACW-200.

6.3 TDWR OT&E INTEGRATION TEST STRUCTURE/MANAGEMENT.

The hierarchal structure of personnel for the TDWR OT&E Integration activities, as well as the details necessary to discern the management of test operations, are presented in the following subsections.

6.3.1. Definition of Roles.

The defined roles for conducting the TDWR OT&E Integration efforts are presented below. It is important to note that all positions will not necessarily have to be manned for every test. Figure 6.3.1-1 presents the hierarchy structure of the test team.

6.3.1.1 TDWR Associate Program Manager for Test

The Associate Program Manager for Test (APMT) is responsible for ensuring that all test requirements are satisfied and that tests are performed in accordance with approved procedures. The APMT also directs and conducts OT&E Integration and Operational tests. The APMT responsibilities have been delegated to ACW-200 for the TDWR test efforts.

6.3.1.2 TDWR Test Director (ACW-200).

The Test Director is responsible for the overall management of the TDWR OT&E Integration test effort and shall provide management guidance through the Test Coordinators and other members of the test team. Test Director authority and responsibilities have been delegated to ACW-200 for TDWR test efforts.

6.3.1.3 TDWR Test Coordinator (ACW-200).

The Test Coordinator is responsible for the overall TDWR test coordination to ensure that individual missions are properly structured and mission objectives are accomplished. The Test Coordinators will select the appropriate Test Managers based upon suitability, expertise, and availability. The Test Managers will work with the Test Director on unresolved problems, recommend remedial action, and provide general support to the Test Director. The Test Coordinator shall have the responsibility to ensure that the appropriate level of software necessary for testing is available.

6.3.1.4 TDWR Test Manager (ACW-200).

The Test Manager will coordinate scheduling of the system support facility and other test support facilities. There will be one Test Manager per test to ensure that required equipment and personnel are available prior to the start of the test. The Test Manager shall also conduct the pre- and post-test review for the test, as well as oversee the collection of all applicable data for subsequent analysis.

This individual will maintain the ultimate authority over the specific test assigned. During the actual test, the Test Manager will verify adherence to the test procedures. He will be responsible for controlling the Test Discrepancy Reports and for insuring that the test conduct, mission logs, and summary forms are completed by the Test Monitors. He shall collect all recorded data upon test completion. The Test Manager shall keep the Test Coordinators appraised of test results and ensure that all deficiencies are noted.

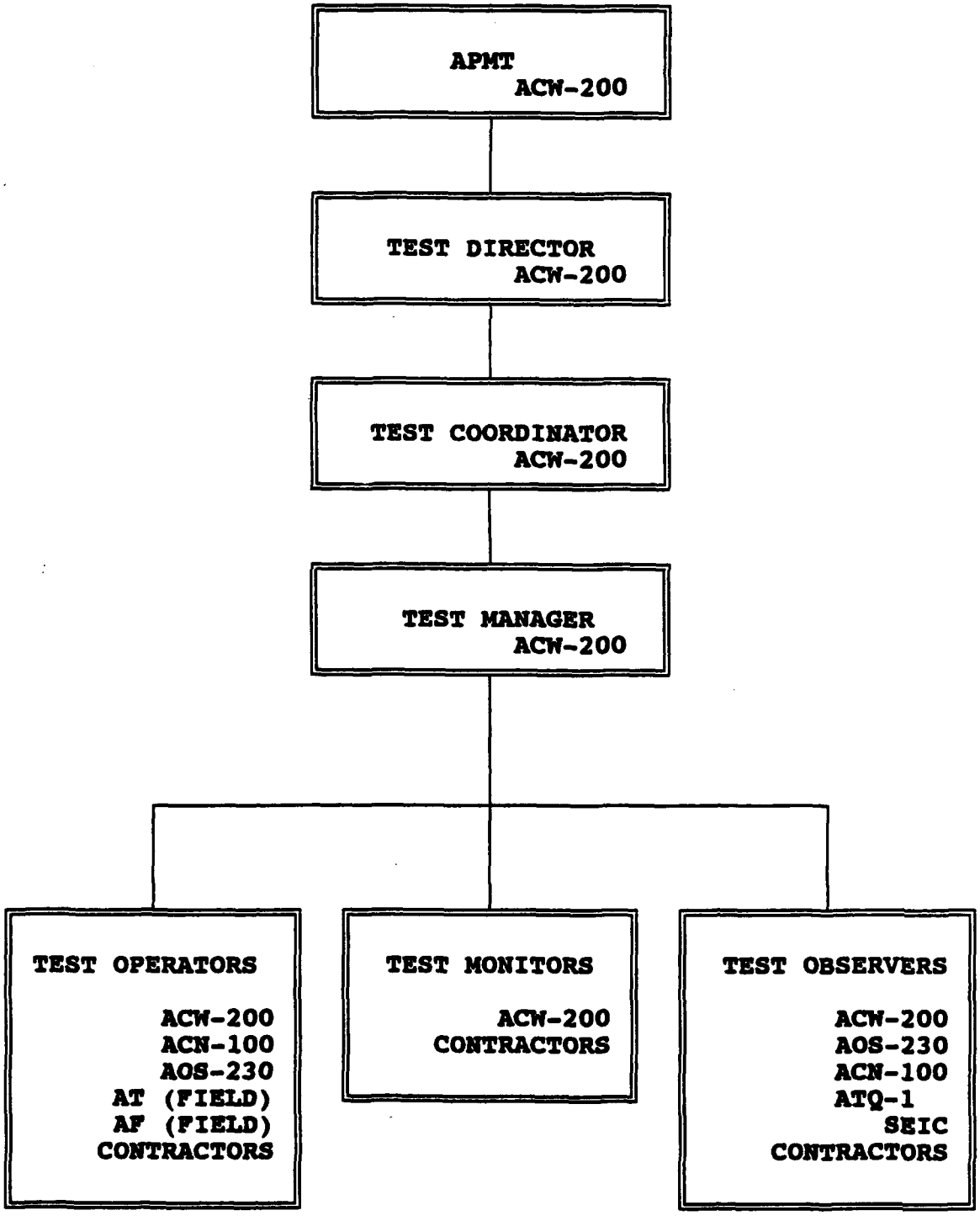


FIGURE 6.3.1-1. TDWR OT&E INTEGRATION TEST TEAM

6.3.1.5 TDWR Test Monitors (ACW-200, ASM-630, ATQ-1, Contractors).

The TDWR Test Monitors will be responsible for ensuring that test scenarios and procedures are being followed by each Test Operator. Test Monitors will assist the Test Manager in verifying that test data flow observations and/or test measurements are recorded at each identifiable test point. Test Monitors will report to the Test Manager and will be required to maintain and complete Test Observer/Monitor Notes.

6.3.1.6 TDWR Test Observers (ACW-200, ASM-630, ATR-240, ATQ-1, SEIC Contractors).

If necessary, technically qualified Test Observers will be assigned to monitor and record activities for specific test procedures and to provide assistance to personnel manning the test positions. Test Observers will also maintain Test Observer/Monitor Notes.

6.3.1.7 TDWR Test Operators (ACW-200, ASM-630, AT and AF Field Site Personnel, Contractors).

The TDWR Test Operators will be personnel assigned to man the test positions during a particular test. They will be expected to follow the order of the test, record test anomalies, and, if necessary, request assistance from the Test Observers. For the conduct of these tests, the Test Operator will be under the direct supervision of the Test Manager. In addition, Computer Operators will fall under this category and will assist in bringing up the system, setting up the test, and responding to system interrupts during run execution. The Computer Operators will assist in gathering run hardcopy and executing all data reduction jobs, indicated by the Test Manager, required for analysis of the test.

6.4 TDWR OT&E INTEGRATION RESOURCE REQUIREMENTS.

The following subsections define resource requirements for facilities and personnel to support the TDWR OT&E Integration.

6.4.1 TDWR OT&E Integration Facility Requirements.

TBD

6.4.2 TDWR OT&E Integration Personnel Requirements.

The following subsections define the number and type of personnel that will be required for OT&E Integration.

6.4.2.1 TDWR OT&E Integration Test Management Group.

Test management will be accomplished by the TDWR Test Management Group described in section 6.1.

6.4.2.2 TDWR OT&E Integration Test Support Personnel.

A list of the number and type of the support personnel that is required to conduct and evaluate the TDWR OT&E Integration is shown in table 6.4.2.2-1.

TABLE 6.4.2.2-1. TDWR OT&E INTEGRATION TEST SUPPORT PERSONNEL

GOVERNMENT PERSONNEL	NUMBER OF PEOPLE	POSITION
ACW-200	1	Test Coordinator
ACW-200	1	Test Manager
ACW-200	2	Test Monitor
AT Field Personnel	1-2	Test Operator
AF Field Personnel	1-2	Test Operator
ASM-630	1-2	Test Operator
ACW-200	1	Test Operator
ACW-200	3	Test Operator
ATQ-1	1	Test Observer
SUPPORT CONTRACTORS		
SEIC	1-2	Test Observer

Note: Test Monitor, Test Operators, and Test Observers shall be utilized to perform data analysis.

7. TDWR OT&E INTEGRATION DOCUMENTATION REQUIREMENTS AND CONTROL.

This section identifies the test documentation, reviews, and reports that are necessary for TDWR OT&E Integration.

7.1 DOCUMENTATION.

The required documents for planning, conducting, and reporting the TDWR OT&E Integration activities are presented below. Figure 7.1-1 illustrates the sequence of documentation preparation, while table 7.1-1 identifies responsibility for each product and when it is to be completed.

7.1.1 TDWR OT&E INTEGRATION TEST PLAN.

This plan establishes the specific test configurations, verification categories, critical/noncritical issues, objectives, schedules, resource requirements, test methodology, and test management organization. It contains the TVRTM which defines the NAS-SS-1000 system requirements.

7.1.2 TDWR OT&E Integration Test Procedures.

The Test Procedures will contain step-by-step instructions for testing the requirements associated with each verification category. These procedures shall be produced and executed to determine whether the TDWR system meets the appropriate NAS requirements. They will be developed by ACW-200 and will be written in accordance with FAA-STD-024a, appendix III.

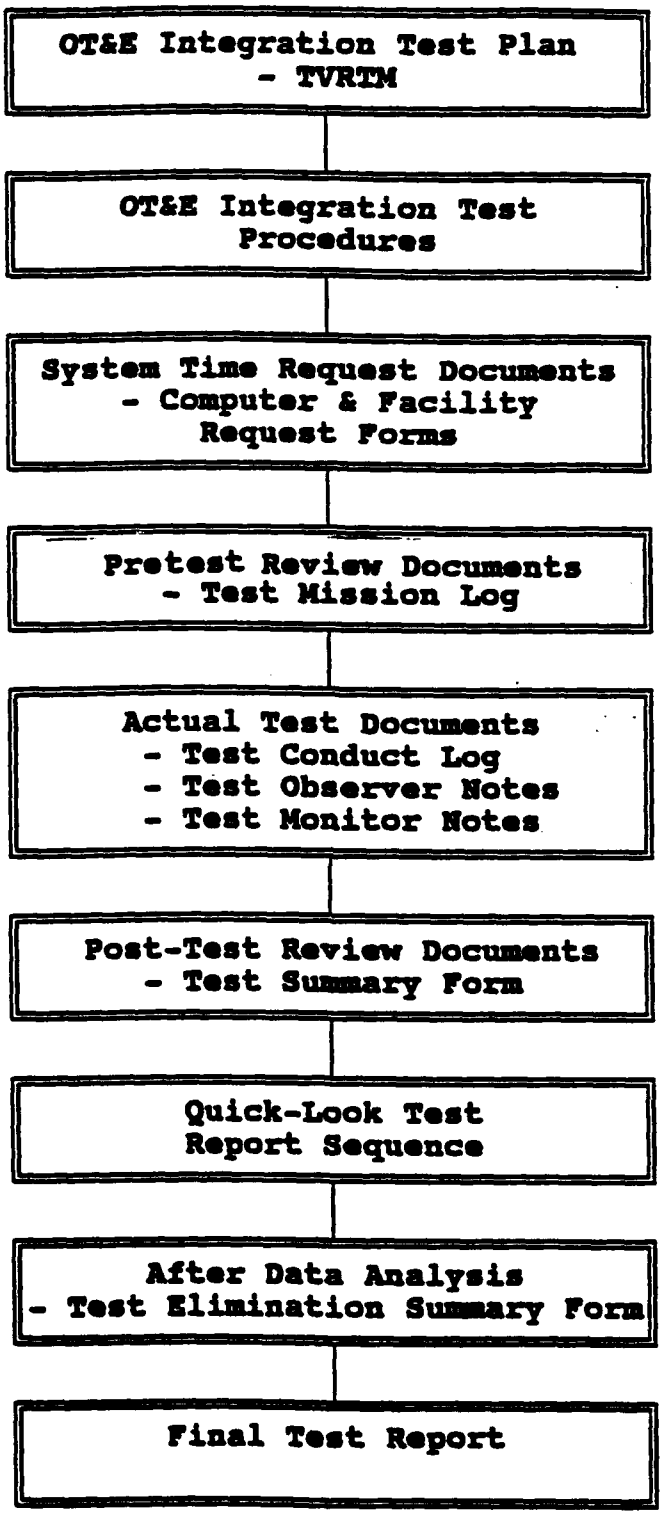


FIGURE 7.1-1. TDWR OT&E INTEGRATION TEST DOCUMENTATION FLOW

TABLE 7.1-1. TEST FORM/DOCUMENT/REPORT MATRIX

FORMS/DOCUMENTS/REPORTS	WHEN COMPLETED	RESPONSIBILITY
OT&E Integration Test Plan	12/90	ACW-200
OT&E Integration Test Procedures	06/91	ACW-200
Computer and Facility Req. Forms	Prior To Test	Test Manager
Test Mission Log	Pretest Review	Test Manager
Test Service Report	During Test	Test Manager
Test Monitor Notes	During Test	Test Monitor
Test Observer Notes	During Test	Test Observer
Test Conduct Log	During Test	Test Manager
Test Summary Form	Post-Test Review	Test Manager
Post-Test Briefing Package	Post-Test Review	Test Manager
Quick Look Test Report	10 Days After Test	Test Manager
Test Evaluation Summary	Following Data Analysis	Test Coordinator
Final Test Report	30 Days After OT&E Integ. is completed	Test Director

7.1.3. Test Documents.

Test Conduct Logs will be used by each of the Test Monitors and Operators to record test events. The Test Manager shall be responsible for obtaining these logs at the conclusion of the test.

Test Observer and Monitor Notes will be used by each of the Test Observers and Monitors to record all relevant events occurring during the test. These notes will provide information that will contribute to the initial test assessment.

Examples of Test Conduct Logs, Test Observer Notes, and Test Monitor Notes will be included in the OT&E Integration Test Procedures.

7.1.4 Post-Test Documents.

In the Post-Test Review, the Test Summary Forms shall be completed by the Test Manager. During this time, a preliminary assessment of the test shall be discussed as well as the anomalies and deviations that were noted during the test.

Following data analysis, Test Evaluation Summaries will be used to record information relevant to post-test evaluation. The summaries will be maintained by the Test Coordinator and will include the following: (1) test identification, (2) purpose of the evaluation, (3) data to be evaluated, (4) evaluation method, and (5) evaluation results.

Examples of the Test Summary Forms and the Test Evaluation Summaries will be included in the OT&E Integration Test Procedures.

7.2 REPORT DOCUMENTATION.

The following subsections define the necessary reports that will be generated for OT&E Integration (see table 7.1-1).

7.2.1 Quick Look Test Report.

For each test conducted, a Quick Look Test Report will be produced by the Test Manager and will be provided to the Test Director within 10 working days after test completion. This report will give the early status information for the system while the analysis process is still underway. It will provide an immediate indication of the outcome of a test and highlight test discrepancies noted during test execution and their significance.

The Quick Look Test Report will contain the following:

a. A completed Quick Look Test Report cover page.
b. The post-test briefing package (described in section 7.3.4).
c. Minutes of the post-test briefing.

7.2.2 Final Test Report.

The TDWR Test Director will be responsible for preparing a Final Test report. A "Draft" report will be delivered to the Program Manager 30 days after the completion of OT&E Integration. The Final Test Report will document the results of detailed test analysis, and assess the compliance of each test to defined criteria. The status of problems identified previously in the Quick Look Test Reports will be updated. A revised assessment will be made of their impact on the tested system and the suggested corrective actions required.

Any new problems discovered by detailed evaluation will be identified and their impact in the system described.

The Final Test Report will contain the following:

a. Description of the test configurations.

b. Reference to the applicable test plan and procedures.

c. Identification of the specific tests and the dates of the test runs.

d. The purpose of the tests.

e. The specific test objectives, including reference to applicable requirements and specifications.

f. A list of all test equipment, including manufacturer, model, calibration, status, and serial number.

g. A description of the evaluation criteria used for each test, including the range of data and parameter values tested.

h. A summary of the results of each test. A matrix will also be included that translates the test results into the success criteria and compares it with the specification requirement.

i. Detailed test results listing the results of the test based on the data collected during the test. For each step of a test procedure where a discrepancy occurred, identification of the procedure step number, the expected response, the actual response, the significance of the discrepancy, and the impact of the discrepancy on the validity of preceding or following steps of the test procedure, shall be provided. Associated information should be included.

If individual trouble reports are prepared, these may be referenced in the test report in lieu of repeating their information.

j. A summation of the problems and their status.

k. Test Evaluation - An overall analysis of the performance of the article tested will be provided. This analysis will describe the functional and operational capability as demonstrated in the testing. If applicable, this section will include assessment of the manner in which the test environment is different from the operational environment, and its effect on the functional performance capability. A general statement will be provided for each operational deficiency, and the impact on the system if the deficiency is not corrected.

7.2.3 Test Service Reports.

The Test Manager shall ensure all test discrepancies and problems observed during testing are documented. The Service Report shall be used to document these test discrepancies and problems. These Service Reports will go to the Program Office for resolution. An example of the Service Report will be included in the OT&E Integration Test Procedures.

7.3 REVIEWS.

The following subsections identify the types of reviews and meetings that will be conducted prior to, during, and after OT&E Integration. Table 7.3-1 presents each of these events, as well as the responsibility to which they are assigned.

TABLE 7.3-1. TEST REVIEW AND MEETING MATRIX

TEST REVIEWS	RESPONSIBILITY
Weekly Status Review	ACW-200
Monthly Status Review	ACW-200
Notification of Test Letter	Test Director
Test Readiness Review	Test Director
Pretest Review	Test Manager
Post-Test Review	Test Manager
Deployment Readiness Review	Program Manager

7.3.1 Notification of Test Letter.

A Notification of Test Letter will be prepared by the TDWR Test Director and submitted to the ANR-500 Program Manager prior to the start of the Test Readiness Review (TRR) for OT&E Integration. Copies will go to participating organizations. This notification letter will contain the following information concerning the upcoming test:

a. Scheduled date, time, and place for the TRR.
b. The specific tests that are to be run.

7.3.2 Test Readiness Review (TRR).

Two weeks prior to the start of the first test, a Test Readiness Review will be conducted by the TDWR Test Director to assess the readiness to begin OT&E Integration.

7.3.3 Pretest Review.

This review, chaired by the Test Manager, will be scheduled immediately prior to the start of the test and will be attended by all test personnel. The review will include the status of prerequisites, software and system equipment (TDWR and other systems and facilities), and a test summary. The pretest briefing will also accomplish the following:

a. Identify any needed changes, and mark up the procedures accordingly.

b. Review the hardware and software configurations of the environment.

c. The Test Manager will ensure that all items in the material checklist (contained in the Test Procedures) have been received.

d. Provide Test Problem Report (TPR) forms to attendees.

e. Generate a record of the pretest briefing on a TDWR Test Briefing Minutes form.

7.3.4 Post-Test Review.

This review will be held upon test completion. It will be chaired by the Test Manager and attended by the full test team. This meeting will review the results of the test activity. An assessment of the quality of the test, TPRs, and the impact of problems encountered will be discussed during the review of the Test Manager's post-test briefing package.

In the post-test review, the Test Manager will prepare a post-test briefing package. The package will include the following:

a. The "as-run" hardware and software configuration, how it differed from that stated in the procedures and its significance to the test results.

b. Any procedure step deviations and their significance to the test results. Procedure steps with problems noted and/or TPRs initiated against them will be rescheduled for retest as required.

d. Discrepancies, anomalies and exceptions recorded during the test, and their significance to the test results.

e. A summary of the outcome of the test.

7.3.5 Status Review Meetings.

These review meetings will serve to keep the TDWR Test Support Group abreast of the status of OT&E Integration. These meetings will be chaired by ACW-200, and will commence during development of the OT&E Integration Test Plan and Procedures. The status reviews will serve as a technical interchange of issues and concerns. The OT&E Integration Test Plan, test procedures, scenarios, test conduct status, and problems will be addressed.

7.3.6 Deployment Readiness Review (DRR).

A DRR will be prepared, scheduled, and conducted in accordance with FAA Order 1810.4B and ADL-1, Interim Operating Procedure, dated February 1987, for NAS Programs Deployment Readiness Review (DRR) Process. The DRR process will provide the status on all of the TDWR project activities, identify open issues, and enable the formulation of conclusions and recommendations to these issues. The DRR also ensures that adequate attention and resources are focused on these issues to ensure timely resolution to deployment.

The DRR process will begin 16 months prior to delivery of the first operational site. Individuals involved with the TDWR OT&E Integration activities will support the DRR process, as directed by the Program Manager.

8. TDWR OT&E INTEGRATION TRAINING.

This section presents the training needed for the personnel participating in TFT&E activities. The TFT&E is scheduled to run from June through September 1992.

8.1 TRAINING REQUIREMENTS.

8.1.1 AT Operations and AF Maintenance Training.

Raytheon is required to develop, prepare, and validate an operational and a maintenance training course for field personnel and for AT and AF. The AT training course will last 1 week and be held at the TDWR test site. The software and hardware maintenance training courses will last 6 weeks and be held at the FAA Aeronautical Center, OK.

8.1.2 Test Team Training.

Before technical test and evaluation begins, Raytheon is required to provide a TDWR engineer to conduct a one-time course to familiarize test-team personnel with the TDWR equipment including hands-on instruction. This course will enable test team personnel to observe and assist in the conduct of testing.

9. TDWR OT&E INTEGRATION ACTIVITY SCHEDULES.

This section presents the schedules for TDWR OT&E Integration Activities. The TDWR OT&E Integration Activities are traceable and supportive of the TDWR Project Master Baseline Schedule.

9.1 TDWR OT&E INTEGRATION ACTIVITIES SCHEDULES.

This schedule indicates the TDWR OT&E Integration Test Activity and is shown in figure 9.1-1. The schedules are developed, released, and controlled by the Test Director, ACW-200. The function of these schedules is to provide schedule direction to all TDWR activities. They identify the major tasks to be accomplished within a given test area (e.g., Test Plan and Test Procedures complete) and identify test-task durations, start-stop dates, and major training issues. These schedules enable the Test Director to provide detailed test status to the test groups.

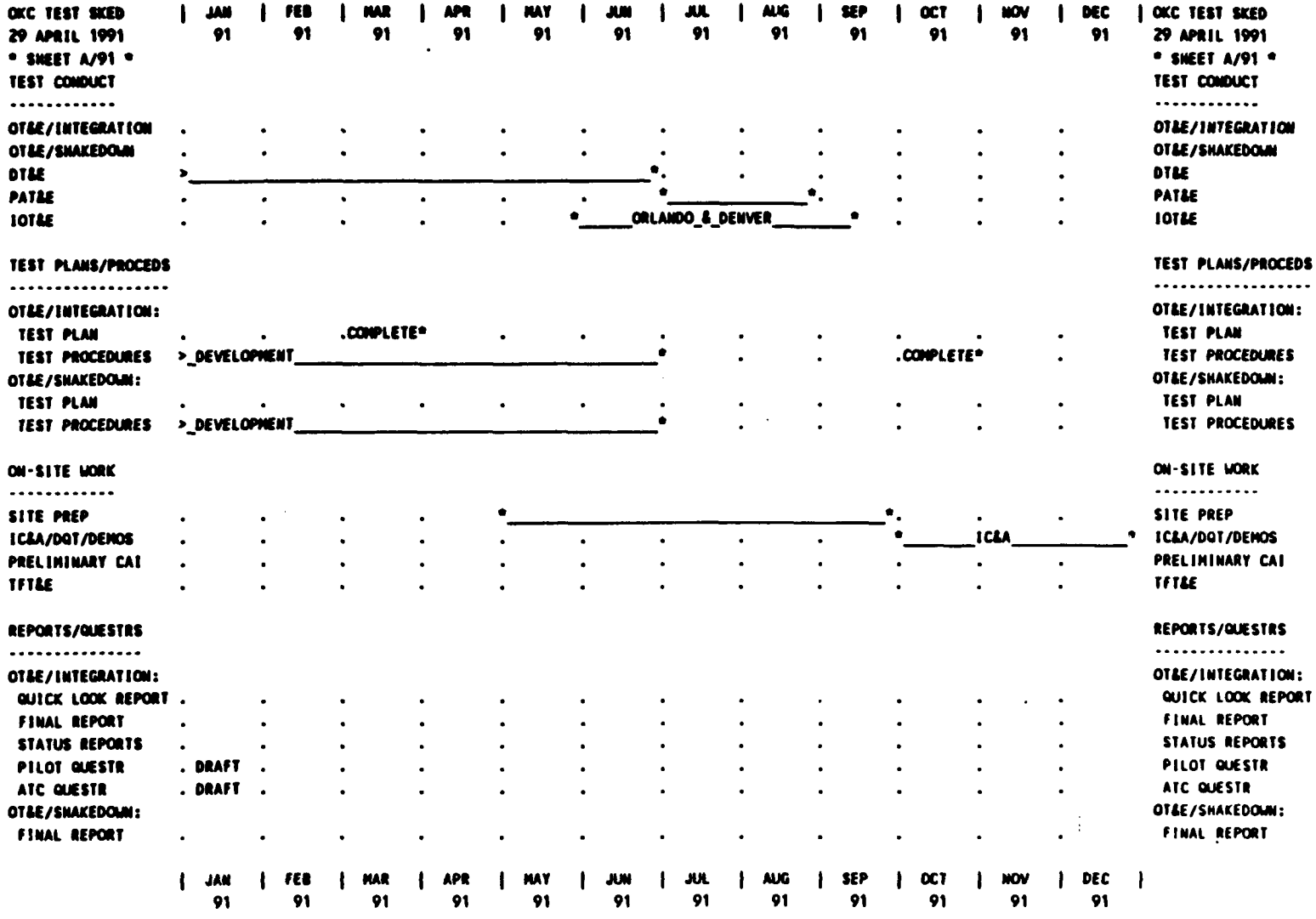


FIGURE 9.1-1. TDWR OT&E INTEGRATION ACTIVITIES (Sheet 1 of 4)

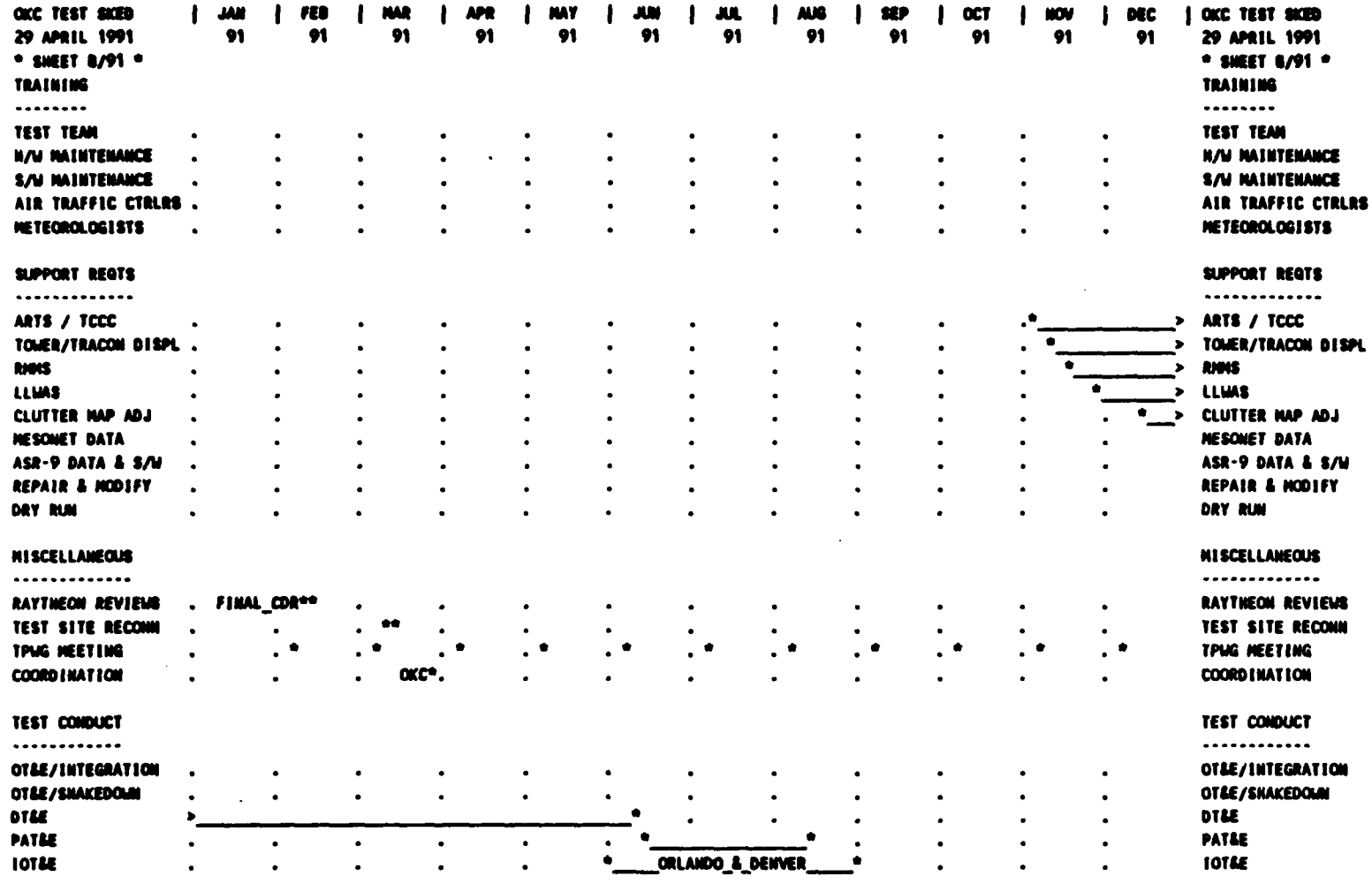


FIGURE 9.1.1. TDWR OT&E INTEGRATION ACTIVITIES (Sheet 2 of 4)

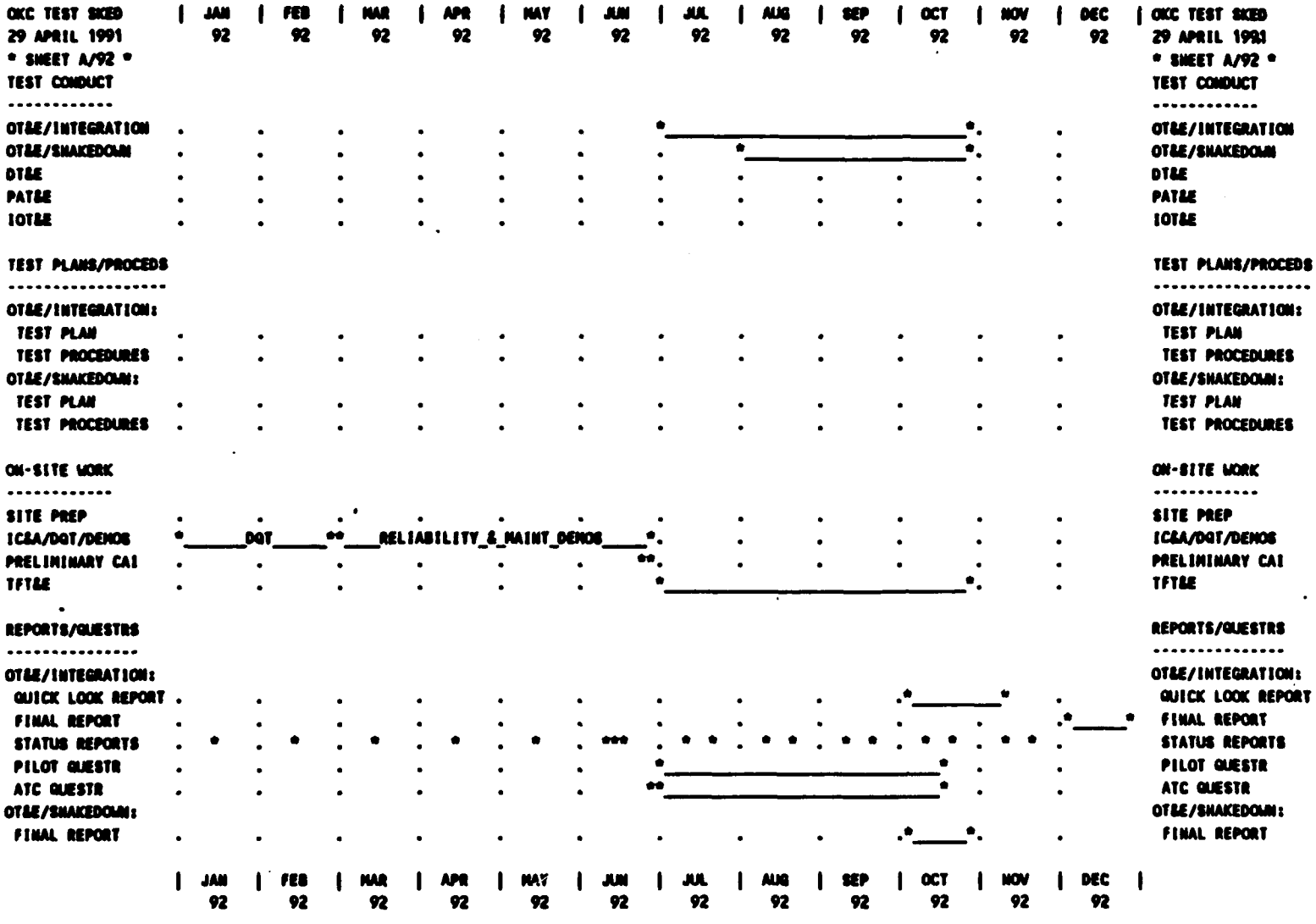


FIGURE 9.1.1. TDWR OT&E INTEGRATION ACTIVITIES (Sheet 3 of 4)

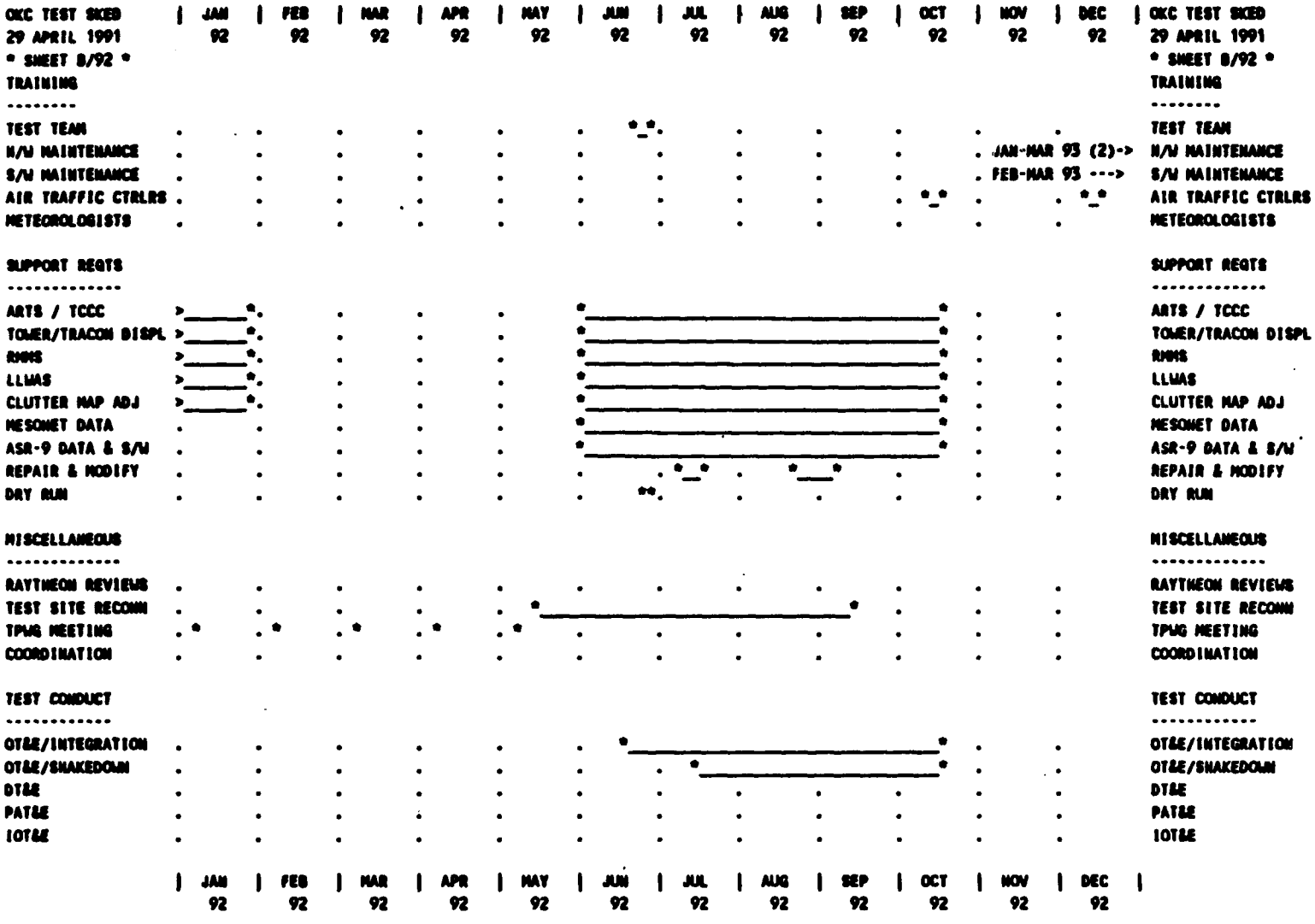


FIGURE 9.1.1. TDWR OT&E INTEGRATION ACTIVITIES (Sheet 4 of 4)

10. ACRONYMS AND ABBREVIATIONS.

AF	Airways Facilities
AT	Air Traffic
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
CAI	Contractor Acceptance Inspection
CMTP	Contractor's Master Test Plan
D	Demonstration
DQT	Design Qualification Test
DRR	Deployment Readiness Review
DT&E	Design Test and Evaluation
FAA	Federal Aviation Administration
GFE	Government-Furnished Equipment
GSD	Geographic Situation Display
HVAC	Heating, Ventilation, and Air Conditioning
IC&A	Installation Checkout and Acceptance
ICD	Interface Control Document
Kb	Kilobytes
LLWAS	Low Level Wind Shear Alert System
LRU	Line Replaceable Unit
MDT	Maintenance Data Terminal
MPS	Maintenance Processor Subsystem
NAS	National Airspace System
NCAR	National Center for Atmospheric Research
OT&E	Operational Test and Evaluation
PCAI	Preliminary Contractor Acceptance Inspection
PC	Personal Computer
PIP	Project Implementation Plan
RDT	Ribbon Display Terminal
RMMS	Remote Maintenance Monitoring System
RMS	Remote Monitoring Subsystem
SEIC	Systems Engineering and Integration Contractor
T	Test
T&E	Test and Evaluation
TCCC	Tower Control Computer Complex
TDWR	Terminal Doppler Weather Radar
TFT&E	Technical Field Test and Evaluation
TPR	Test Problem Report
TRACS	Transportable Radar Analysis Computer System
TRR	Test Readiness Review
TVRTM	Test Verification Requirements Traceability Matrix

APPENDIX A

TDWR OT&E INTEGRATION TVRTM

A-1 INTRODUCTION.

The TDWR TVRTM is the most essential part of the NAS OT&E Integration process. It reflects all of the TDWR NAS-SS-1000 system requirements and will serve as the single tracking tool accounting for their verification throughout the integration cycle.

Note: As of this writing, the TCCC interface (Category A) will not be available for OT&E Integration testing (June - September 1992). Upon availability of this interface, testing will be planned and conducted.

A-II COLUMN DEFINITIONS AND UTILIZATION.

The following definitions and information is provided for better user understanding:

REQT ID - Unique requirement identification number, developed primarily for database useage and for ease in referencing within section 5.0 of this plan.

CAT - Verification category to which the requirement has been allocated. Refer to section 5.0 of this plan for more information on the categories.

RELTD PARA - Paragraph numbers where the requirement can be located throughout this document.

NAS-SS-1000 - Primary paragraph number of the NAS-SS-1000 to where requirement can be traced.

VOL - NAS-SS-1000 volume number where requirement can be found.

C/NC - Indicates critical or noncritical requirements based on table 3-6 of NAS-SR-1000 and the cross reference matrix of the NAS System Specification.

REQTS DESCRIPTION - Requirement statements per the NAS System Specification.

VERF MTHD - Verification Method. Denoted by either:
"D" for Demonstration or
"T" for Test.

(See section 3.2.2 for definition.)

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
1170	A	5.1.1	3.2.1.2.5.1.6	3	NC	The TDWR shall disseminate weather products to the TCCC.	D
1171	A	5.1.1	3.2.1.2.5.1.6	3	NC	The TDWR shall disseminate alarm messages to the TCCC.	D
1290	A	5.1.1	3.2.1.2.5.2.10	3	NC	The TDWR shall disseminate data to the TCCC.	D
2110	B	5.1.2	3.2.1.1.9.1.A	1	NC	The TDWR shall continually monitor subsystem performance to obtain the data needed by specialists for maintenance and operations support.	D
2120	B	5.1.2	3.2.1.1.9.1.B	1	NC	The TDWR shall provide the status of subsystems to specialists and shall generate an alarm upon the deviation of designated parameters from prescribed limits.	D
2130	B	5.1.2	3.2.1.1.9.1.C	1	NC	The TDWR shall provide the capability for a specialist on site or at an off-site location to control selected subsystems for maintenance purposes.	D
2140	B	5.1.2	3.2.1.1.9.1.D	1	NC	The TDWR shall provide the specialist the capability to identify the line replaceable unit causing an equipment failure.	D
2150	B	5.1.2	3.2.1.1.9.1.G	1	NC	The TDWR shall provide the specialist access to the monitoring, control, and data management capabilities of the TDWR as required and as authorized by administrative directive.	D
2210	B	5.1.2	3.2.1.2.9.A	1	NC	The TDWR shall provide the capability to continually monitor the status, alarms/alerts, and performance data of selected subsystems.	T
2220	B	5.1.2	3.2.1.2.9.B	1	NC	The TDWR shall provide the capability to detect and present alarms and state changes from selected subsystems to NAS specialists within an average time of 10 seconds and a maximum time (99th percentile) of 60 seconds.	T
2230	B	5.1.2	3.2.1.2.9.C	1	NC	The TDWR shall provide the capability to execute control commands (that cause a state change) initiated by NAS specialists within an average time of 5 seconds and a maximum time (99th percentile) of 15 seconds.	T
2240	B	5.1.2	3.2.1.2.9.D	1	NC	The TDWR shall provide the capability to develop and present certification, diagnostic test, and unmanned facility data as requested by NAS specialists or determined in adaptation within an average time of 2 minutes and a maximum time (99th percentile) of 10 minutes.	T
2250	B	5.1.2	3.2.1.2.9.E	1	NC	The TDWR shall provide an acknowledgement to a specialist of a subsystem's receipt of a valid test command, input by the specialist, within an average time of 15 seconds and a maximum time (99th percentile) of 75 seconds.	T

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
2310	B	5.1.2	30.1.1.1	1	NC	The TDWR shall provide for the monitoring of designated subsystem's performance parameters.	D
2320	B	5.1.2	30.1.1.2	1	NC	The TDWR shall provide subsystem operating status data including configuration and mode of operation.	D
2330	B	5.1.2	30.1.1.3	1	NC	The TDWR shall provide subsystem status reports that contain only state changes in response to a subsystem status request.	D
2331	B	5.1.2	30.1.1.3	1	NC	The TDWR shall provide subsystem status reports that contain only alarms/alerts in response to a subsystem status request.	D
2340	B	5.1.2	30.1.1.4	1	NC	The TDWR shall automatically provide for the accumulation of current subsystem status in a local data file.	D
2341	B	5.1.2	30.1.1.4	1	NC	The TDWR shall automatically provide for the accumulation of current subsystem performance data in a local data file.	D
2350	B	5.1.2	30.1.1.5	1	NC	The TDWR shall provide subsystem data in response to requests from RMMS subsystems.	D
2360	B	5.1.2	30.1.1.6	1	NC	The TDWR shall provide an alarm when any designated NAS subsystem monitored parameter is out of tolerance.	D
2370	B	5.1.2	30.1.1.7	1	NC	The TDWR shall provide an alarm when smoke in a subsystem facility has occurred (site specific).	D
2371	B	5.1.2	30.1.1.7	1	NC	The TDWR shall provide an alarm when fire in a subsystem facility has occurred (site specific).	D
2372	B	5.1.2	30.1.1.7	1	NC	The TDWR shall provide an alarm when a physical intrusion into a subsystem facility has occurred (site specific).	D
2380	B	5.1.2	30.1.1.8	1	NC	The TDWR shall provide an alarm when the electrical power monitored parameters are out of tolerance at unmanned facilities (site specific).	D
2381	B	5.1.2	30.1.1.8	1	NC	The TDWR shall provide an alarm when HVAC monitored parameters are out of tolerance at unmanned facilities (site specific).	D
2390	B	5.1.2	30.1.1.9	1	NC	The TDWR shall provide a return-to-normal alarm when an initial alarm condition is cleared.	D
2410	B	5.1.2	30.1.1.10	1	NC	The TDWR shall provide an alert when selected subsystem parameters are outside a predetermined range.	D
2420	B	5.1.2	30.1.1.11	1	NC	The TDWR shall provide the capability to set ranges for subsystem alarm or alert parameters.	D

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
2421	B	5.1.2	30.1.1.11	1	NC	The TDWR shall provide the capability to change ranges for subsystem alarm or alert parameters.	D
2430	B	5.1.2	30.1.1.12	1	NC	The TDWR shall provide for the disabling of a subsystem alarm or alert by a specialist on site.	D
2440	B	5.1.2	30.1.1.13	1	NC	The TDWR shall report the disabling of a subsystem alarm or alert as performance data.	D
2450	B	5.1.2	30.1.1.14	1	NC	The TDWR shall provide subsystem certification data in response to a certification exercise.	D
2460	B	5.1.2	30.1.1.15	1	NC	The TDWR shall provide subsystem diagnostic data in response to a diagnostic test request.	D
2470	B	5.1.2	30.1.1.16	1	NC	The TDWR shall provide for the monitoring of electrical power and HVAC systems in unmanned subsystem facilities (site specific).	D
2480	B	5.1.2	30.1.1.17	1	NC	The TDWR shall provide for the monitoring of smoke, fire, physical intrusion, or any other site hazard in unmanned subsystem facilities (site specific).	D
2490	B	5.1.2	30.1.1.18	1	NC	The TDWR shall provide for the control to change the current operating mode of a subsystem to any other proper operating mode of a subsystem including on/off.	D
2510	B	5.1.2	30.1.1.19	1	NC	The TDWR shall provide the capability to adjust selected subsystem parameters.	D
2520	B	5.1.2	30.1.1.20	1	NC	The TDWR shall provide the capability to reset a subsystem.	D
2521	B	5.1.2	30.1.1.21	1	NC	The TDWR shall provide for the initiation of subsystem diagnostic tests for the purpose of fault isolation.	D
2530	B	5.1.2	30.1.1.22	1	NC	The TDWR shall provide for the initiation of subsystem certification exercises.	D
2540	B	5.1.2	30.1.1.23	1	NC	The TDWR shall provide for the control of the electrical power and HVAC system in unmanned facilities (site specific).	D
2550	B	5.1.2	30.1.1.24	1	NC	The TDWR shall provide for specialist access to the RMMS network through a maintenance data terminal with the proper authorization.	D
2560	B	5.1.2	30.1.1.25	1	NC	The TDWR shall provide the capability for local input and display of data and commands to a subsystem via the maintenance data terminal.	D
2570	B	5.1.2	30.1.1.26	1	NC	The TDWR shall provide the specialist the capability to obtain exclusive control of a subsystem while on site.	D

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
2610	B	5.1.2	3.2.1.2.5.1.7	3	NC	The TDWR shall have built-in remote monitoring elements capable of monitoring subsystem status and alarms.	D
2620	B	5.1.2	3.2.1.2.5.1.8	3	NC	The TDWR shall be capable of supplying operational status.	D
2630	B	5.1.2	3.2.1.2.5.1.9	3	NC	The TDWR shall accept and process operational control commands from valid external sources.	D
2640	B	5.1.2	3.2.1.2.5.1.10	3	NC	The TDWR shall accept and process remote maintenance control commands.	D
2650	B	5.1.2	3.2.1.2.5.1.11	3	NC	Diagnostic software shall be made available for automated assistance for on-site maintenance.	D
2660	B	5.1.2	3.2.1.2.5.1.12	3	NC	The TDWR shall receive and maintain timing synchronized to universal coordinated time to support system recording and maintenance and distribution of products.	D
2670	B	5.1.2	3.2.1.2.5.2.11	3	NC	The TDWR shall monitor status, respond to commands, generate alarms, and transmit maintenance status as specified in 3.2.1.1.4.2.1, 3.2.1.1.4.2.2, 3.2.1.1.4.2.3, and 3.2.1.1.4.2.7 of Volume V.	T
3010	C	5.1.3	3.2.1.1.4.1.B	1	NC	The TDWR shall collect and/or sense weather information that pertains to the area of NAS responsibility for terminal and en route operations.	D
3020	C	5.1.3	3.2.1.1.4.1.D	1	NC	The TDWR shall provide tabular and pictorial displays of weather information to support the specialist.	D
3030	C	5.1.3	3.2.1.1.4.1.G	1	NC	The TDWR shall classify weather information as hazardous which may impact flight operations.	D
3040	C	5.1.3	3.2.1.1.4.1.K	1	NC	The TDWR shall generate weather products which support the interpretation of weather conditions by NAS specialists and users.	D
3050	C	5.1.3	3.2.1.1.4.1.N	1	NC	The TDWR shall archive weather information for use in event reconstruction and accident investigation.	D
3060	C	5.1.3	3.2.1.2.4.A.1	1	NC	The TDWR shall detect the current surface weather conditions at selected airports at least once every minute.	T
3070	C	5.1.3	3.2.1.2.4.A.1.B	1	NC	The TDWR shall detect the current weather conditions aloft at least once every 5 minutes for all airspace within the terminal area from ground level to 10,000 feet AGL within 45 nmi of designated airports.	T
3080	C	5.1.3	3.2.1.2.4.B.1.A	1	NC	The TDWR shall classify weather information as hazardous or potentially hazardous within 1 minute from the time it receives the hazardous weather information.	T

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
3090	C	5.1.3	3.2.1.2.4.E.1	1	NC	The TDWR shall perform all processing required to produce and/or complete a description of the current, trend, or predicted weather conditions by deriving from raw data the products needed by specialists and users.	D
3110	C	5.1.3	3.2.1.2.4.E.2	1	NC	The TDWR shall perform all processing required to produce and/or complete a description of the current, trend, or predicted weather conditions by using automated weather detection systems.	D
3120	C	5.1.3	3.2.1.2.5.1.1.A	3	NC	The TDWR shall identify the presence of a microburst.	D
3121	C	5.1.3	3.2.1.2.5.1.1.B	3	NC	The TDWR shall identify the presence of a gust front.	D
3122	C	5.1.3	3.2.1.2.5.1.1.C	3	NC	The TDWR shall identify the presence of wind shift.	D
3123	C	5.1.3	3.2.1.2.5.1.1.D	3	NC	The TDWR shall identify the presence of precipitation.	D
3130	C	5.1.3	3.2.1.2.5.1.2.A	3	NC	The TDWR shall measure and make estimates of reflectivity.	D
3131	C	5.1.3	3.2.1.2.5.1.2.B	3	NC	The TDWR shall measure and make estimates of mean radial velocity.	D
3132	C	5.1.3	3.2.1.2.5.1.2.C	3	NC	The TDWR shall measure and make estimates of spectrum width.	D
3140	C	5.1.3	3.2.1.2.5.1.3.A	3	NC	The TDWR shall analyze return radar signals to determine the type of weather.	D
3141	C	5.1.3	3.2.1.2.5.1.3.B	3	NC	The TDWR shall analyze return radar signals to determine the location of weather.	D
3142	C	5.1.3	3.2.1.2.5.1.3.C	3	NC	The TDWR shall analyze return radar signals to determine the velocity of weather.	D
3143	C	5.1.3	3.2.1.2.5.1.3.D	3	NC	The TDWR shall analyze return radar signals to determine the severity of weather.	D
3150	C	5.1.3	3.2.1.2.5.1.4.A	3	NC	The TDWR shall generate a microburst map.	D
3151	C	5.1.3	3.2.1.2.5.1.4.B	3	NC	The TDWR shall generate a microburst message/alarm.	D
3152	C	5.1.3	3.2.1.2.5.1.4.C	3	NC	The TDWR shall generate a gust front map.	D
3153	C	5.1.3	3.2.1.2.5.1.4.D	3	NC	The TDWR shall generate a gust front message/alarm.	D
3154	C	5.1.3	3.2.1.2.5.1.4.E	3	NC	The TDWR shall generate a wind shift map.	D
3155	C	5.1.3	3.2.1.2.5.1.4.F	3	NC	The TDWR shall generate a wind shift message/alarm.	D
3156	C	5.1.3	3.2.1.2.5.1.4.G	3	NC	The TDWR shall generate a precipitation map.	D

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
3160	C	5.1.3	3.2.1.2.5.1.5	3	NC	The TDWR shall generate alarm messages indicating the presence of microburst, gust front, wind shift when prespecified threshold conditions occur.	D
3170	C	5.1.3	3.2.1.2.5.1.6	3	NC	The TDWR shall disseminate weather products to the TCCC.	D
3171	C	5.1.3	3.2.1.2.5.1.6	3	NC	The TDWR shall disseminate alarm messages to the TCCC.	D
3180	C	5.1.3	3.2.1.2.5.1.13	3	NC	The TDWR shall provide the capability to disseminate weather products to additional subsystems and support future interfaces.	D
3181	C	5.1.3	3.2.1.2.5.1.13	3	NC	The TDWR shall provide the capability to disseminate alert messages to additional subsystems and support future interfaces.	D
3190	C	5.1.3	3.2.1.2.5.2.1	3	NC	The TDWR shall detect hazardous weather phenomena between 0 and 360 degrees in azimuth.	T
3191	C	5.1.3	3.2.1.2.5.2.1	3	NC	The TDWR shall detect hazardous weather phenomena between .25 and 48 nmi in range.	T
3192	C	5.1.3	3.2.1.2.5.2.1	3	NC	The TDWR shall detect hazardous weather phenomena from 0 to 24,000 feet AGL.	T
3210	C	5.1.3	3.2.1.2.5.2.2.A	3	NC	The TDWR shall have an azimuth resolution of 1 degree.	T
3211	C	5.1.3	3.2.1.2.5.2.2.B	3	NC	The TDWR shall have the following range resolution: 150 meters.	T
3212	C	5.1.3	3.2.1.2.5.2.2.C	3	NC	The TDWR shall have the following elevation resolution: 0.5 degree for elevations less than or equal to 3.0 degrees; 1 degree for elevations above 3.0 degrees.	T
3220	C	5.1.3	3.2.1.2.5.2.3.A	3	NC	The TDWR azimuth error accuracy shall not exceed .05 degree over the entire detection envelope.	T
3221	C	5.1.3	3.2.1.2.5.2.3.B	3	NC	The TDWR range error accuracy shall not exceed 50 meters.	T
3222	C	5.1.3	3.2.1.2.5.2.3.C	3	NC	The TDWR elevation error accuracy shall not exceed .05 degree.	T
3230	C	5.1.3	3.2.1.2.5.2.4	3	NC	The TDWR shall be capable of detecting a -10.0 dBz range bin and beam filling target with a signal-to-noise ratio of 6 dB at a range of 16 nmi.	T
3240	C	5.1.3	3.2.1.2.5.2.5	3	NC	The TDWR shall be capable of operating within the frequency band of 5.6 GHz to 5.65 GHz.	T
3250	C	5.1.3	3.2.1.2.5.2.6	3	NC	The TDWR shall be capable of providing weather data continuously while operating under the following scanning strategies: 360 degrees azimuth scans; azimuth sector scans; range height indicator scan.	T

REQT ID	CAT	RELTD PARA	NAS-SS-1000	VOL	C/NC	REQTS DESCRIPTION	VERF MTD
3260	C	5.1.3	3.2.1.2.5.2.7	3	NC	The TDWR shall be capable of archiving 1 hour of derived products.	T
3270	C	5.1.3	3.2.1.2.5.2.8	3	NC	The TDWR shall generate a microburst, gust front, or wind shift alarm within 15 seconds from detection of the alarm condition.	T
3280	C	5.1.3	3.2.1.2.5.2.9	3	NC	The TDWR shall provide weather data to specialists that is no older than 1 minute.	T
3290	C	5.1.3	3.2.1.2.5.2.10	3	NC	The TDWR shall disseminate data to the TCCC.	D
3291	C	5.1.3	3.2.1.2.5.2.10	3	NC	The TDWR shall disseminate data to the MPS/RMSC.	D
3310	C	5.1.3	3.2.1.2.5.2.12	3	NC	Weather data shall be categorized into 6 levels of intensity as follows: Level 1: 18 = < dBz < 30; Level 2: 30 = < dBz < 41; Level 3: 41 = < dBz < 46; Level 4: 46 = < dBz < 50; Level 5: 50 = < dBz < 57; Level 6: dBz = > 57. No data display shall be made for dBz values less than 18.	T

APPENDIX B

TDWR OT&E INTEGRATION HUMAN FACTORS EVALUATION QUESTIONNAIRE

BRIEFING ON THE HUMAN FACTORS EVALUATION OF THE TDWR AT MEMPHIS FOR AIR TRAFFIC CONTROLLERS, SUPERVISORS, AND PARTICIPANTS.

The FAA Technical Center is supporting the test of the TDWR concept at Memphis International Airport (MEM). One of our support roles is the collection and analysis of user evaluation from you, the MEM controller/user of the system. We are collecting user data by means of questionnaires. We want to get your evaluation of the TDWR after it is integrated into your display system.

The questionnaire consists of 12 questions and is 12 pages long. You will be asked to complete the form just prior to the end of the TDWR demonstration, on or about November 1, 1992.

We realize that you are busy; therefore, we have designed the questionnaire to minimize the time and effort needed to complete it. Your inputs as users of TDWR and its display/control interface are very important in this effort to improve airport weather hazard detection and the display interface.

Please read over the questions carefully. If any of them are unclear, ask the FAA Technical Center representative for clarification.

The reason for briefing you on this test and evaluation effort is to alert you for things to look for and to think about when you use the TDWR. This should be helpful to you when you have to complete the questionnaire.

Questionnaire TDWR EVALUATION

Operator Initials _____ Form Completion Date _____.

POSITION (circle those which are applicable)
TRACON --- TOWER --- SUPERVISOR ---STAFF

QUESTIONNAIRE FOR CONTROLLERS AT MEMPHIS INTERNATIONAL AIRIPORT
HUMAN FACTORS EVALUATION OF TDWR

Please complete this form and return to the representative of the FAA Technical Center. If you place your operating initials and the date of completion at the top of this page, it may help us to resolve your suggestions and discussions. Your answers will be held in strict confidence.

1. Please rate different aspects of the TDWR using the following scale: (Place check marks in appropriate columns.)

+3 = Very Good
+2 = Good
+1 = Fairly Good
0 = Fair
-1 = Fairly Poor
-2 = Poor
-3 = Very Poor
? = Don't Know

If you did not observe a particular function, you need not answer that question or portion of the question.

For example, if you did not use the Supervisor's Graphical Situation Display, you do not need to answer the GSD questions.

ASPECT OF TDWR	RATING SCALE								
	-3	-2	-1	0	+1	+2	+3	?	
a. Daytime readability of the display									
(1) GSD									
(2) RDT									
b. Nighttime readability of the display									
(1) GSD									
(2) RDT									
c. Readability of display in glare									
(1) GSD									
(2) RDT									
d. Adequacy of display size									
(1) GSD									
(2) RDT									
e. Audibility of the alarm beeper									
(1) GSD									
(2) RDT									
f. Placement of the display									
(1) GSD									
(2) RDT									

ASPECT OF TDWR	RATING SCALE								
	-3	-2	-1	0	+1	+2	+3	?	
g. Completeness of the displayed information									
(1) GSD									
(2) RDT									
h. Accuracy of the displayed information									
(1) GSD									
(2) RDT									
i. Rate of false alarms (many=-3 ; few=+3)									
(1) GSD									
(2) RDT									
j. Timeliness of the displayed information									
(1) GSD									
(2) RDT									
k. Usefulness of the displayed information									
(1) GSD									
(2) RDT									
l. Freedom from misinterpretation									
(1) GSD									
(2) RDT									

ASPECT OF TDWR	RATING SCALE								
	-3	-2	-1	0	+1	+2	+3	?	
m. Ease of accessing needed wind information									
(1) GSD									
(2) RDT									
n. Speed of system response									
(1) GSD									
(2) RDT									
o. Information grouping and order within rows									
(1) GSD									
(2) RDT									
p. Aptness of message abbreviations									
(1) GSD									
(2) RDT									
q. Naturalness of spoken phraseology									
(1) GSD									
(2) RDT									
r. Suitability for continued field use									
(1) GSD									
(2) RDT									

ASPECT OF TDWR	RATING SCALE								
	-3	-2	-1	0	+1	+2	+3	?	
s. How useful would wind arrows be on the GSD?									
t. Rate usefulness of the Gust Front Presentation									
GSD									
u. Rate usefulness of the Wind Shift Prediction									
GSD									
v. Rate usefulness of the TDWR training received									
(1) GSD									
(2) RDT									
w. Rate usefulness of the TDWR runway management									
(1) GSD									
(2) RDT									

ASPECT OF TDWR	RATING SCALE								
	-3	-2	-1	0	+1	+2	+3	?	
Rate the usefulness of the following:									
x. Tornado Vortices Presentation									
y. Storm Motion and Track Presentation									
z. Windshear Predictions									

Any comments on the above? _____

_____

_____

_____

Please comment on the TDWR training received:

_____

_____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

2. Do you see the TDWR as a help or hindrance to you in your job of controlling local traffic? (Please circle one letter below.)

a. A great help
b. A help
c. A slight help
d. Neither help nor hindrance
e. A slight hindrance
f. A hindrance
g. A great hindrance
h. Don't know

Any comments? _____

_____

_____

_____

3. Do you see the TDWR as a help or a hindrance to the pilot? (Please circle one letter below.)

a. A great help
b. A help
c. A slight help
d. Neither help nor hindrance
e. A slight hindrance
f. A hindrance
g. A great hindrance
h. Don't know

Any comments? _____

_____

_____

_____

4. Do you see the TDWR as a help or a hindrance to Planning and Traffic Management? (Please circle one letter below.)

a. A great help
b. A help
c. A slight help
d. Neither help nor hindrance
e. A slight hindrance
f. A hindrance
g. A great hindrance
h. Don't know

Any comments? _____

_____

_____

_____

5. What's good about the TDWR? What benefits do you see?

_____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

6. What's poor about the TDWR? What problems do you see?

_____

_____

_____

_____

7. Please rate the relative magnitude of benefits and problems of the TDWR by circling the appropriate letter below.

a. Benefits greatly exceed problems.
b. Benefits exceed problems.
c. Benefits slightly exceed problems.
d. Benefits equal problem.
e. Problems slightly exceed benefits.
f. Problems exceed benefits.
g. Problems greatly exceed benefits.
h. Don't know.

Any comments? _____

_____

_____

_____

8. Compare the overall effectiveness of the TDWR to the LLWAS. Choose a phrase below to fill the blank. "The TDWR is _____ the LLWAS."

a. much better than
b. better than
c. slightly better than
d. about the same as
e. slightly worse than
f. worse than
g. much worse than
h. Don't know

Any comments? _____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

9. Based on your present knowledge, please rate the TDWR's suitability for widespread operational use in the field. Please circle one of the letters a. through h.

a. Suitable, fine as is, don't make any changes.

b. Suitable, minor adjustments optional.

c. Suitable, but some changes beneficial.

d. Marginally suitable, but make changes.

e. Unsuitable, changes definitely needed prior to installation.

f. Unsuitable, concept OK, but extensive rework mandatory.

g. Unsuitable, entire concept inappropriate.

h. Don't know.

10. Based on your present knowledge, please rate the TDWR usefulness to the pilot.

_____ Very Good
_____ Good
_____ Fairly Good
_____ Fair
_____ Fairly Poor
_____ Poor
_____ Very Poor
_____ Don't Know

Please list here any changes you feel should be made to the TDWR.

_____

_____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

11. For future planning, please indicate (by check marks) on the chart below which of the TDWR DISPLAY DATA PRODUCTS you would desire to have available for selection and which DISPLAY you would desire to see them on. Assume that you would have a "Push Button" to select or deselect the weather products as desired.

	TDWR DISPLAY PRODUCTS				
	No extra data	Precip-itation	Gust-front	Micro-burst	Wind Arrows
TRACON Control Position Display (DEDS, etc.)					
TOWER Control Position Display (BRITE, etc.)					
TOWER Control Position GSD Type Display Used In Place of "BRITE", with ARTS Data as on BRITE Display now					
"Cockpit" mini GSD					

Any additional comments or suggestions:

_____

_____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

If you did not observe Wind Shear Prediction Products, then proceed to page 15.

12. THE WIND SHEAR PREDICTION PRODUCTS QUESTIONS

A. If you did observe Wind Shear Predictions:

How well did it work? _____

_____

Did it successfully predict wind shear? (Give examples)

_____

_____

_____

_____

_____

Did it give false alarm? (Give examples)

_____

_____

_____

_____

_____

Operator Initials _____ Form Completion Date _____.

B. Was the product useful and did it aid in making runway configuration changes? (Give specific times.)

C. Did you use the product to alert controllers that windshears might be imminent? (Y/N) _____.

D. Was the display format acceptable? Would you change anything?

E. What comments do you have on the product? How could it be improved?

Operator Initials _____ Form Completion Date _____.

As an experienced Air Traffic Control Specialist and user of this equipment, your input is valuable to us in our efforts to improve it and to increase the efficiency and safety of the National Airspace System.

Thank you for your cooperation.

PATRICK MARTIN, TEST DIRECTOR